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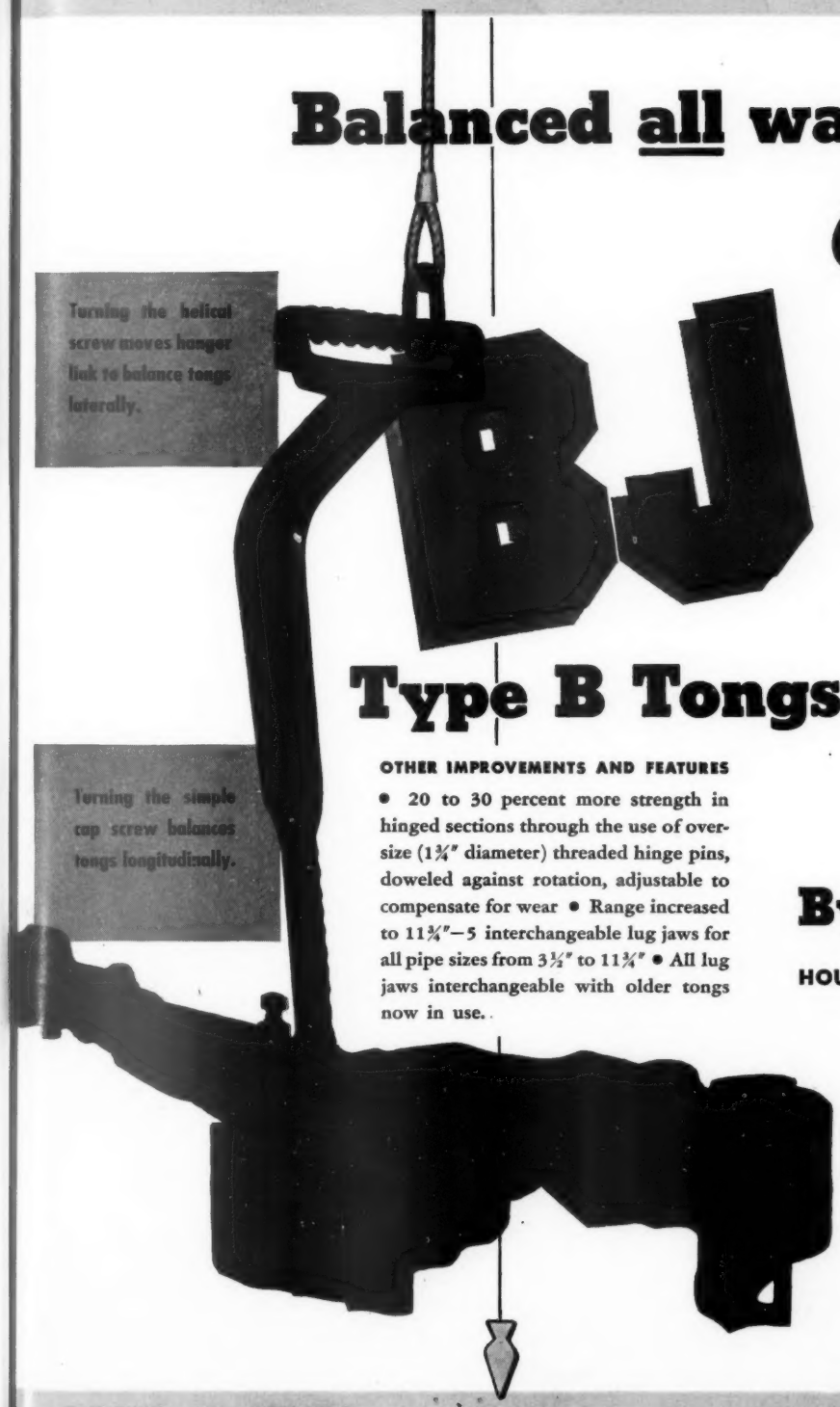
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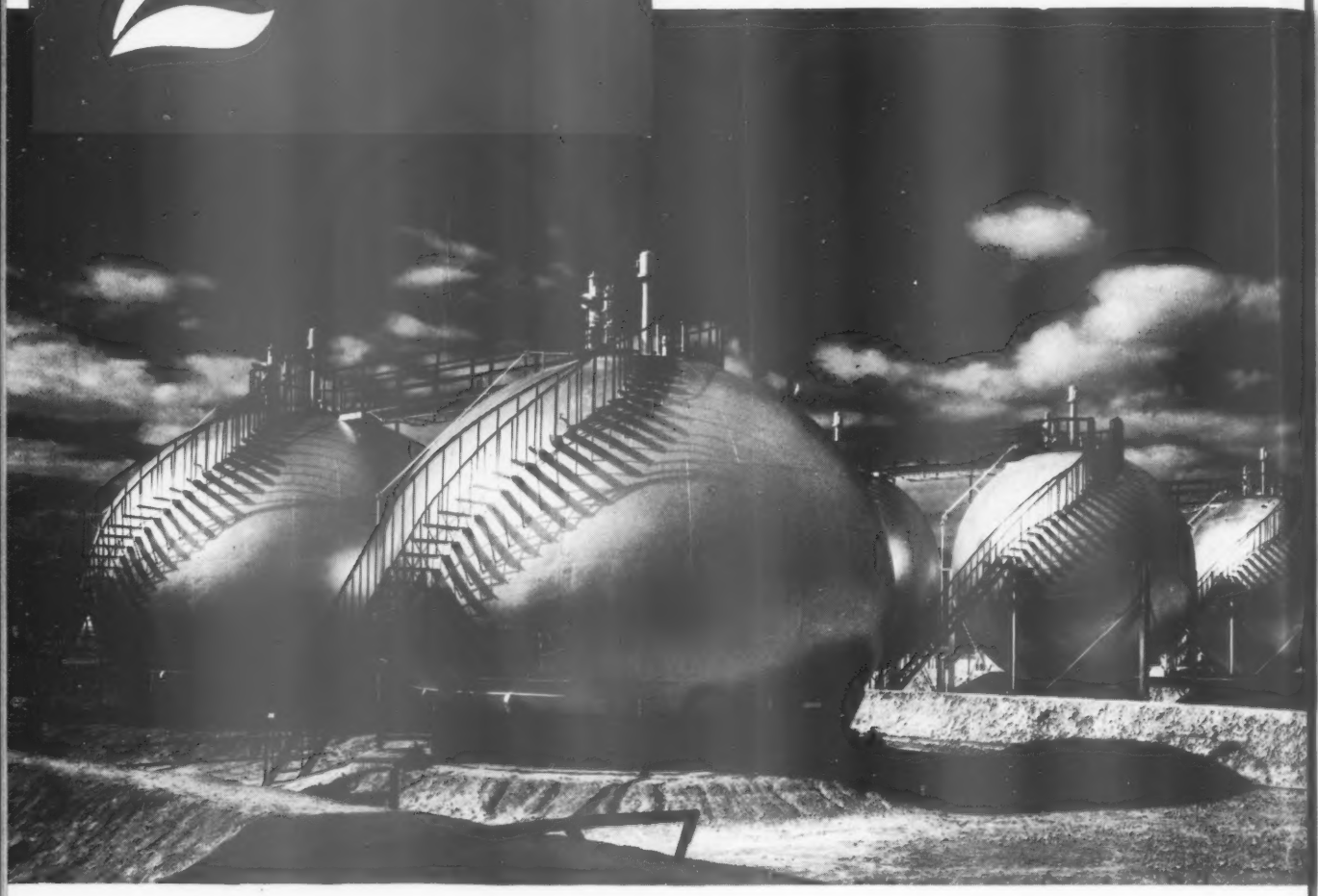

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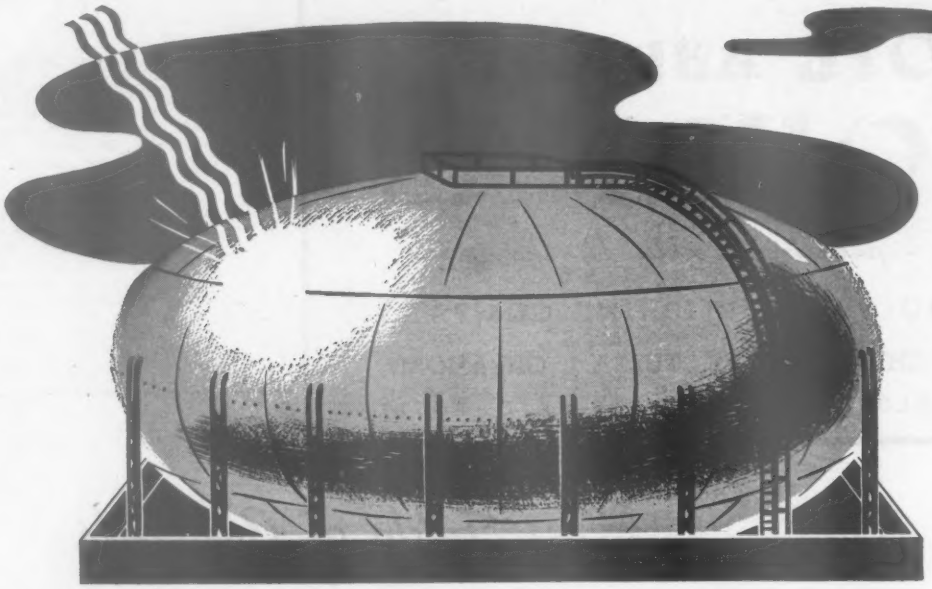

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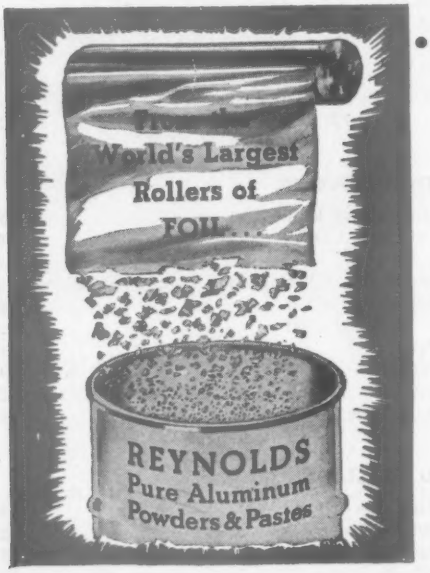

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Postwar Exploration

THE memory of most readers goes back to a period in which petroleum geology was not accepted as an integral part of the industry's operations. Men still active as producers recall the decision of a major company to employ a geologist but insisted on keeping the action a secret in order to avoid possible criticism or banter from other operators. About the same time a bolder executive, partially convinced that a geologist might be of some assistance to his land department, hired a member of the new profession but paid the salary out of his own pocket, not feeling that he could justify the exceedingly modest outlay as a company expense.

But more than 2,000 petroleum geologists, paleontologists, and geophysicists met at Chicago last week under the auspices of their three national organizations and the entire industry was interested in everything they did. There is no group of more highly trained scientists and technicians in any industry.

Considerable time could have been spent at the meetings reviewing the war accomplishments of the membership but little was said. Certain vital instruments of land, water, and air operations would never have been perfected for war use had the practice of searching for oil by geophysical methods not been well established previous to the emergency. War secrecy still applies to some of these developments.

The future as outlined at Chicago is to be spearheaded with expanded research. In common with the other operating divisions of the oil business, petroleum's explorationists are in agreement that the coming years must have the sound base of many-headed research findings.

This research and development work is to be coordinated reflecting the agreement that there must be an interweaving of all efforts to find new oil reserves, including the expansion of those already partially outlined. Geologists are more appreciative than ever before of the value of geophysical data. Geophysicists concede that their data need geological interpretation. Paleontologists are coming out of the narrow canyon of specialized applications and are looking to the broad uses of their tools. Equally outstanding is the fact that geology does not stop with the finding of oil. In the most successful recovery operations of recent years geologists and engineers pooled their combined knowledge.

All these objectives obviously cannot be accomplished without executive support. Larger capital outlays in many instances will be necessary. Considerable time will elapse in the successful completion of some projects. Fortunately management is now recognizing geology as the essential front line of its operations. With this support the science of finding oil moves into the postwar period in a new spirit of mental vigor and confidence.

Radioactivity May Be Important Factor in Forming Petroleum

ATLANTIC CITY, N. J.—Reporting on efforts to establish the part played by radioactivity in the formation of oil, a group of Massachusetts Institute of Technology scientists told the American Chemical Society annual meeting here last week that fatty acids isolated from ocean-bottom mud can be turned into oil-type hydrocarbons by bombardment in a cyclotron.

The M.I.T. investigations, reported by Irving A. Breger, Dr. Charles W. Sheppard, and Miss Virginia Burton, may explain how nature accomplished the conversion of protoplasm, proteins, fats, and other complex material into oil. In the cyclotron bombardment, radon, a gas formed when radium spontaneously disintegrates, was used as the source of the alpha particles.

The report to the organic division of the society pointed out that investigations about 10 years ago tended to disprove the belief that high temperatures and pressures contributed to energy responsible for the origin of oil. "Recently it has been proposed that bacterial action or the energy from the high-speed particles released by radioactivity may play an important role. . . . Research by the M.I.T. geology department has shown there may be sufficient radioactivity in the materials of oil fields to effect this conversion over a period of 10 million to 100 million years," the report said.

Before the society's petroleum division, 34 papers reporting research were presented. Chemists from laboratories of leading oil companies participated.

n-Butane Conversion Research

A. G. Oblad and M. H. Gorin, Magnolia Petroleum Co., described research on the conversion of n-butane to isobutane in an effort to develop a process for large-scale production and to determine some of the important characteristics of the reaction. The conversion of n-butane as brought about by aluminum bromide was studied. The consumption of oxygen and aluminum bromide proved to be interrelated, and the end product was an aluminum-bromide hydrocarbon complex and alumina.

Ethylbenzene, a liquid hydrocarbon of importance in making synthetic rubber, was described by Alfred W. Francis, E. Emmet Reid, A. A. O'Kelly, John Kellett, and J. B. Plucker, Socony-Vacuum Oil Co., Inc. It is readily converted to styrene, helps in making antiknock gasoline, and has other uses as a solvent.

The petroleum division also was told that organic peroxides in petroleum, long regarded as nuisances, are proving valuable in jet-propulsion fuels and in many other industrial applications. Uses of the peroxides were outlined in a paper by Adalbert Farkas, Andrew I. Smith, and Arthur F. Stribley, Jr., Union Oil Co. of California.

Papers of interest to the petroleum industry were given before several other divisions of the society. Dr. Charles F. Fryling, Phillips Petroleum Co., reported on a new rubber made by isoprene. Phillips, he said, has produced pure isoprene on a scale large enough to supply experimental quantities for making synthetic rubber, and in the light of lessons learned during the war, it has been found possible to make isoprene rubber by emulsion copolymerization with styrene.

In a paper before the organic division, a heavy oil containing many valuable polynuclear hydrocarbons was reported as the primary product of the liquefaction of coal by high-pressure hydrogenation. This report was given in a discussion by Milton Orchin and E. Oscar Woolfolk, Bureau of Mines.

Louisiana's Stand Against Gas Export Assailed by FPC Hearing Witness

CHARLESTON, W. Va. — Pointed criticism of the stand of officials of the State of Louisiana against export of natural gas and the state's unwillingness "to share its natural resources" was heard by Federal Power Commission in testimony here last week.

The witness was N. Knowles Davis, chief engineer of the Georgia Public Service Commission. In a statement prepared by the Georgia commission, he also leveled a general attack on the value of the FPC investigation of the natural-gas industry and suggested it be abandoned.

The federal commissioners were holding the seventh of their regional hearings in the natural-gas investigations here. The climaxing hearing is set for Washington June 17. FPC is conducting its fact-finding inquiry on possible amendments to the federal natural gas act for the purpose of controlling end use of gas and other regulation.

Testimony of Davis and other witnesses during the 4 days of the hearing last week followed the general pattern set in previous hearings. From West Virginia, Ohio, Georgia, New York, Pennsylvania, and even the District of Columbia came public officials and industrial executives to express their preference for natural gas as a fuel and voice their opposition to any extension of federal control.

Davis recalled to the commission that in its notice of the investigation it had said it would inquire into potential reserves, conservation, the end use of natural gas as well as factors of competition with a view to making recommendations for additional legislation. Such legislation, he continued, could have but two results:

1. "Invasion of the sphere of state authority and interference with local self government.
2. "A further shift in the already dangerous trend toward controlled economy ultimately resulting in regimentation."

Davis said that if FPC has a job to do, it can do it cooperatively with state authority. "If Louisiana is unwilling to share its natural resources with other states, then it has the power to make its resources more profitable to its own citizens through the imposition of a severance tax," he asserted. "If other states desire to conserve their natural resources, the legislatures of these states can enact such laws as are required or create conservation commissions with adequate authority to deal with the problems."

The Georgia engineer also presented an exhibit which he said showed that if major users of natural gas for boiler fuel in Georgia were restricted from using gas for that purpose, residential and commercial consumers would be forced to pay about 21 per cent additional.

James Flanagan, chairman of the Public Utilities Commission of the District of Columbia, said "our principal desire is that nothing in the regulation of natural gas should interfere with its free flow into the

District of Columbia. . . . The Act of Congress which created the Public Utilities Commission vested in it ample powers to supervise and regulate the end use of natural gas."

A charge that FPC had assumed authority that it was not the intention of Congress to confer was made by C. E. Nethken, chairman of the West Virginia Public Service Commission. He said it was "our understanding" federal regulation would begin where jurisdiction of the state's regulatory body ended. "Much to our surprise and chagrin, this does not seem to be true," he declared.

A factory manager testifying at the hearing conceded under questioning of Commissioner Wimberly, who was presiding at the hearing, that his firm could pay three times as much for gas as it does at present in Ada, Okla., and still make a profit. Testifying was J. W. Carnahan, vice president and general factory manager, Hazel-Atlas Glass Co. He testified his company pays prices varying from 10 cents to 45 cents per 1,000 cu. ft. at its plants throughout the country. Some of the variation, he explained, is due to differing volumes used. Wimberly asked if the company could pay as much as 30 cents for gas at Ada and still make a profit on the product manufactured there. The witness said that while he would not want to have to pay that much, it could be paid and still leave a profit.

Mexican Gas Export Attacked by Three Witnesses at Hearing

WASHINGTON. — Reynosa Pipe Line Co.'s application to export natural gas to Mexico met opposition from a member of the Texas Railroad Commission, a Mexican gas-company official, and a Texas geologist in testimony here last week before Federal Power Commission.

Reynosa Pipe Line has asked the commission for authority to deliver from Texas fields up to 60,000,000 cu. ft., daily, principally for use of industries at Monterrey, Mexico. A 7-day hearing on the proposal was held last December, but the record was reopened here last week at the request of the Texas Railroad Commission for further evidence before a final decision is made.

Olin Culberson, Texas Railroad Commission, in a 14-page statement told FPC that "misrepresentation" of the capacity of Penitas field to supply gas to Monterrey industries was "one of the principal motives for our urgent appeal to you that you reopen this proceeding."

Culberson Called Inconsistent

He said witnesses would show probably four-fifths of the reservoir containing a trillion cubic feet of gas lies on the Mexican side of the border. He said Petroleos Mexicanos, the Mexican Government oil administration, will undoubtedly develop the field and connect its supply of gas with the Monterrey market. Furthermore, Culberson said, gas to be exported under the application provides, not for sustaining existing investments, but partly to permit expansion.

Answering Culberson, Birford Arney, Reynosa Pipe Line attorney, asserted the Railroad Commission is "inconsistent" in that it has made no objection to the export of gas to Mexico by United Gas Pipe Line Co. or to Canada by Panhandle Eastern Pipe Line Co. He said the United States has imported crude from Mexico and that Culberson's opposition should be before Congress, not FPC, since there is no basis for prohibiting exports. Pointing out that part of Culberson's opposition was predicated on the theory that the gas should remain in Texas for a new proposed gasoline-synthesis plant, the attorney said "it is interesting to note that the gasoline so made could be sold in foreign commerce."

Mexican Official Opposes Application

The Mexican gas-company official appearing to oppose the Reynosa application through an interpreter was Joaquin Garcia Y Garcia of Compania Mexicana de Gas. Following a line of testimony also developed by Culberson, Garcia said Mexico should exploit her own resources instead of importing gas from the United States.

Cecil Robinson, McAllen, Tex., testified that the part of Penitas field in Mexico contains 700,000,000,000 cu. ft. of gas—four or five times as much as in the Texas portion of the reservoir. He said there is sufficient gas in northern Mexico to supply Monterrey's needs without imports from Texas.

The hearing was expected to continue through this week. At the same time, FPC is considering the application of United Natural Gas Pipe Line to continue exportation of gas to Compania Mexicana de Gas at an increased rate of 5 cents per 1,000 cu. ft.

No Important Changes In Gasoline Markets

FIRMNESS continued as the dominating note in refinery gasoline markets this week on both coasts and in the Middle West.

While no important changes in quotations were reported, marketers were still anticipating an upward swing in prices as a result of increased summer demand and the recent crude-oil price increase.

Reports from all sections of the country continued to emphasize the continued shortage in heavy residual fuel oils. New York reported demand for heavy fuel oil continuing high with stocks still falling. A seasonal slump was beginning to be felt in demand for kerosene and light fuel oils and distillate stocks were rising. Gasoline, though firm, was being offered plentifully with New York barge prices ranging from 6.9 to 7.6 cents per gallon for regular.

In California, the crude increase brought no immediate change in gasoline prices. Fuel oil, diesel, and heating oil already are selling at ceilings in the area, and the margin between retail and spot prices was reported as being very narrow.

In the Oklahoma area, gasoline sold on the Group 3 basis stood at 5¼ cents for regular, though some few offerings below this figure were reported. Spot price on residual was $1.18. Increased demands for the product were expected as a result of the soft coal strike.

Price Relief Promised for Equipment Manufacturers

WASHINGTON.—Oil-tool and equipment manufacturers whose own materials and labor costs have risen sharply seem destined for price relief in the near future.

Office of Price Administration officials announced an industry-wide meeting will be called in the next 10 days to discuss complete lifting of controls. OPA last week told Rep. Albert Thomas of Texas oil-tool-equipment controls would be removed April 8. Immediate action was deferred pending the meeting at which OPA will reportedly explore the possibility of a link between the equipment ceilings and the production of fuel oil, now in short supply.

Equipment manufacturers have asked increases in ceiling prices in a number of recent applications to OPA, some of which were an aftermath of the steel price boost. OPA earlier said it would not process the applications in view of its decision to lift equipment controls.

Texas Commission Still Opposes Temporary Allowable Increase

by Dahl M. Duff

AUSTIN, Tex. — Supported by the governor, the Texas Railroad Commission still stood, two to one, early this week against a temporary increase in allowed production for April to meet demands of the Navy for more fuel oil.

Unlike his fellow commissioner, E. O. Thompson, Chairman Olin Culberson returned from a conference with Navy officials in Washington still opposed to the emergency order. Commissioner Thompson earlier had come back from Washington advocating the increase.

In a wire to Paul Porter, Office of Price Administration director, the three commissioners joined in placing responsibility for the fuel-oil shortage at the door of OPA. They said there is now in the hands of purchasers and refiners 16,500,000 bbl. of West Texas oil more than was on hand on Pearl Harbor day.

"Present pipe lines from West Texas fields are not large enough to carry an additional 200,000 bbl. per day of West Texas crude of the type desired by the Navy," the commissioners said in their telegram. "If OPA will authorize payment of rail transport over pipe-line charges of West Texas oil, this will help. . . .

"The Railroad Commission urges that restriction on oil and its products be lifted . . . and that adjustments be made that will induce refiners to fill Navy requirements out of West Texas oil already produced and available to them.

"We are convinced that the Navy needs the fuel oil. It should be made available. You can give relief by immediately removing price restrictions which refiners complain preclude a profitable manufacture of Navy fuel oil to fill requirements."

Labor Leader Attacks Situation

Gov. Coke Stevenson of Texas backed the commission majority in a statement here in which he said he was "inclined to follow the lead" of Culberson in refusing the Navy's demand for an additional 200,000 bbl. daily production. Oil prices, the governor said, are another of the OPA's evils, and the situation will work itself out if left alone.

On his return from Washington, Culberson said he was "shocked and amazed" at the "deliberate misrepresentation" in the furor created over the Navy's request. He said he had specifically asked in Washington if the situation would adversely affect homebound troop movements. The answer was "emphatically no," the commission chairman said.

In their telegram to Porter, the commission invited the OPA head to send a representative to the statewide hearing on May allowables which will be held in Austin April 19. In Washington, however, it was reported OPA officials had said they have no plans to appear at the Texas hearing.

Thompson's position, on his return from Washington, was that the need for fuel oil is imperative, regardless of who or what is to blame.

In an effort to aid the fuel-oil situation without raising production, the commission last week cut rail shipping rates on crude oil between McCamey and Galveston, Houston, and Texas City. The new rate will be 15 cents per 100 lb., compared to 35 cents previously.

Governor Backs Commission

O. A. Knight, Fort Worth, president of the Oil Workers International Union, added his voice to the Texas allowable situation. He styled the commission's opposition as a strike against the Navy and questioned whether the Navy would seize the state agency as it did the refineries his organization struck last October.

Another announcement by the Railroad Commission here last week showed that underproduction below allowables in February was 7.13 per cent. Total production for the month was set at 63,077,543 bbl., but indicated production was only 58,580,414 bbl. Underproduction by areas showed 16.7 per cent in North Texas, 10.66 in the Panhandle, 2.73 per cent in East Texas, and 9.88 per cent in the 7-B district of West Central Texas.

Allocation of oil production in Oklahoma was threatened with another court test. Peppers Refining Co. filed with the Corporation Commission an intention to appeal from its order setting April production at 367,000 bbl. daily. Peppers Refining already has appealed the March order to the State Supreme Court.

In Louisiana, the Department of Conservation set April 18 as the date for a market demand hearing in New Orleans to fit pool quotas for May and June.

Reppert Among Speakers For Meeting of N.P.A.

CLEVELAND. — Petroleum economics, Office of Price Administration policies, postwar lubricants, and collective bargaining contracts are among the subjects of the forty-third semiannual meeting of the National Petroleum Association to be held April 18-19 at Hotel Cleveland here.

Speakers for general sessions include J. H. Reppert, associate director, fuel price division, OPA; Fred G. Clark, American Economic Foundation; Merle Thorpe, director of business development, Cities Service Oil Co.; Stewart P. Coleman, Standard Oil Co. of New Jersey; James Tanham, The Texas Co.; and Albert J. Browning, director of the office of domestic commerce, Department of Commerce.

A joint meeting of the department of manufacture and the department of standards and tests is scheduled for the afternoon of April 18. Speakers will be Davis Read, Universal Oil Products Co.; H. R. Noll and K. G. Holdron, Houdry Process Corp.; E. V. Bergstrom, Socony-Vacuum Oil Co., Inc., and H. R. Wolf, General Motors Corp. research laboratories. A round-table discussion of industrial relations is set for the morning of April 19.

Higher Sulfur Permitted

Relaxation of the Government's proposed requirement of 0.1 per cent maximum sulfur content in gasoline was indicated last week when the procurement division of the Treasury Department advised bidders offers will be considered to supply gasoline with a sulfur content up to 0.25 per cent. Federal officials, however, said the degree of maximum sulfur content guaranteed may determine the awards, according to a report received at the Tulsa office of Western Petroleum Refiners Association.

Shell Plans Construction

HOUSTON.—Further expansion of the facilities of Shell Oil Co., Inc. in this area is in prospect following the announcement that a one-story laboratory and office building will be erected for Shell Chemical Corp. at its Deer Park plant.

The structure will cost between $200,000 and $300,000. James Stewart Corp. has the contract for the construction.

Crude Price Increased

BARTLESVILLE, Okla. — Phillips Petroleum Co. has raised the posted price for Texas panhandle crude 3 cents subject to approval of Office of Price Administration. Phillips' posting makes the price $1.35 a barrel for 40° and higher gravity oil.

THIS WEEK

INTERNATIONAL—Russo-Iranian oil agreement gives Soviets exploratory concessions in northern Iran. . . . Russians to control 51 per cent of company during first 25 years of 50-year agreement. . . . Full details of agreement will be revealed soon at Tehran when Iranian parliament considers ratification. . . . ¶State Department denies Ickes' charges that British are annoyed by delay in ratifying Anglo-American treaty. . . . ¶Discontinuance of oil shipments to Spain may be discussed at London by Big 4 foreign ministers. . . . France is pressing for application of economic sanctions. . . .

NATURAL GAS—Opposition to further extension of federal control over natural gas repeated at Charleston hearing. . . . ¶Louisiana criticized for efforts to block exports of its natural gas. . . . ¶Size of West Texas-California proposed gas line may be increased to 30 in. . . . Larger line will cost $16,225,000 when completed to transmit 305,000,000 cu. ft. daily. . . . ¶Cities Service Co. reported preparing to dispose of retail gas outlets. . . . ¶Export of Texas gas to Mexico opposed by state authorities before FPC. . . .

REGULATION—Establishment of substitute agency to continue functions of PAW or extend its wartime work still in discussion stage. . . . Deputy Administrator Davies may disclose plans April 15 or 16 when he testifies before Lea subcommittee. . . . ¶Continuation of many controls anticipated until fuel-oil shortage is remedied. . . . Suasion alone seems inadequate to increase fuel-oil production. . . . Alternative incentive of higher prices denied industry so far. . . . Twenty-one cent increase per barrel still proving inadequate, although helpful. . . .

PRICES—Removal of price ceilings on oil-field equipment may follow industry-wide meeting in Washington. . . . Freeing of equipment prices originally scheduled for April 8. . . . Action deferred until after general discussion between industry and manufacturers. . . . ¶Producers, refiners and state authorities continue efforts to remove OPA control over crude oil and products. . . . OPA unlikely to act until bill extending agency is finally passed. . . . Amendments now tacked on OPA-extension act probably will force decontrol in first presidential report. . . . Extension still requires House floor approval and then goes to Senate. . . . ¶Refinery tank-car prices steady, unchanged.

REFINING—Drastic Order L-355 issued limiting use of tetraethyl lead severe blow to refiners. . . . Small plants, lacking most modern processing facilities, will suffer particularly. . . . Lead offers only medium for equalizing competitive conditions for quality. . . . ¶Industry preparing strong fight to modify order which limits motor fuel to maximum of 80 octane. . . . ¶Complaints from motoring public may be most important argument. . . . Point stressed that tetraethyl fluid requires minor percentage of total lead consumption. . . . ¶American Liberty Oil Co. closes Texas City refinery for lack of crude. . . .

This highway view is part of the "Persian Corridor" extending from the head of the Persian Gulf to Tehran, once more in the headlines because of the new agreement between the governments of Iran and Russia involving oil development in part of northern Iran. During the war the United States and British armies rebuilt and extended highway and rail connections from the Gulf to the Iranian capital and within a period of 3½ years, under lend-lease, delivered 5,000,000 long tons of dry cargo and 3,500,000 bbl. of petroleum products to the Russians. Most of the products came from the Abadan, Iran refinery of Anglo-Iranian Oil Co., Ltd., which up to this time has been the only concession operator in Iran

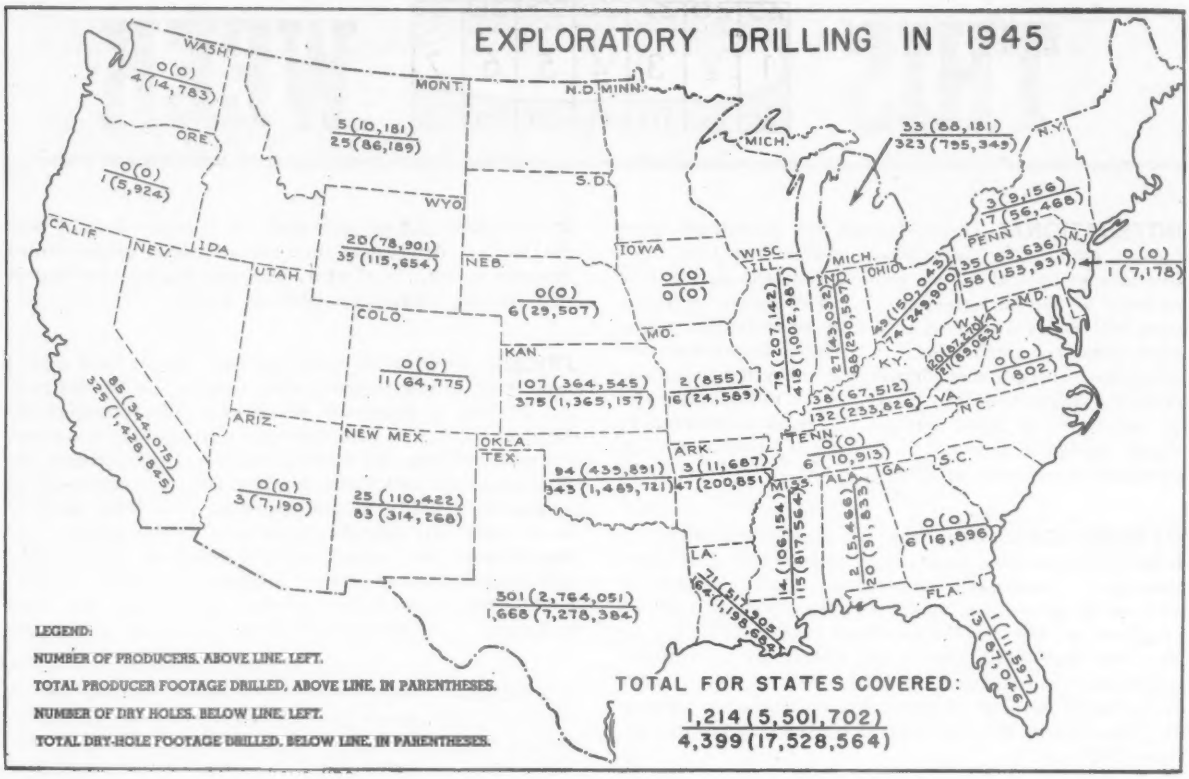

Fig. 1

WILDCAT DRILLING IN 1945

by Frederic H. Lahee

The accompanying extracts are taken from the yearly report by Sun Oil Co.'s chief geologist. The report on 1945 exploratory drilling was first presented at last week's annual meeting of the American Association of Petroleum Geologists in Chicago. Dr. Lahee's compilation of exploratory drilling data is made with cooperation of numerous other company and consulting geologists.

IN the states covered in this review, as shown in Fig. 1, and listed in Table 1, during 1945 a total of 23,030,266 ft. was drilled in 5,613 exploratory holes, divided as follows: 1,214 producers, 5,501,702 ft.; 4,399 dry holes, 17,528,564 ft.

This means that 21.6 per cent of the holes drilled, and 23.9 per cent of the footage drilled, were successful in 1945. One producer foot was drilled for every 3.19 ft. of dry hole. One successful well was drilled for every 3.62 dry holes. The average depth of hole was 4,103 ft.

In the southern states (Fig. 2), in 1945, a total of 13,452,603 ft. was drilled in 2,706 holes, divided as follows: 613 producers, 3,508,301 ft.; 2,093 dry holes, 9,944,302 ft.

In this area, then, 22.7 per cent of the holes drilled, and 26.1 per cent of the footage drilled, were successful. One producer foot was drilled for every 2.83 ft. of dry hole. One successful well was drilled for every 3.41 dry holes. The average depth of hole was 4,971 ft. For comparison with statistics for this same area in 1938, 1939, 1940, 1942, 1943, and 1944, see Table 2.

In Table 3 are listed the reasons for drilling the exploratory holes in 1945, using the best information available. According to these figures, 1,115 exploratory holes drilled on technical advice were successful, and 3,697 were dry; 47 holes, located for nontechnical reasons, were producers, and 404 were dry; 52 producers and 298 dry holes were located for reasons unknown. These figures show that 23.2 per cent of the holes drilled on technical advice were producers as contrasted with 10.4 per cent successful in the case of the holes located without technical advice. Therefore, in 1945, locations based on technical recommendations were 2.2 times as successful as those drilled without such advice.

Comparing last year's figures with figures for 1945, we note the following:

1. There was a very large increase in exploratory drilling in the United States, amounting to an increase of 17 per cent of holes drilled in 1944, and nearly 14 per cent of exploratory footage drilled in 1944.

2. There was an increase in exploratory drilling in most of the states, but the number of holes remained nearly the same in 1945 as in 1944 in Kentucky, Louisiana, and Michigan, and there was a decrease in exploratory holes drilled in Arkansas.

3. The average depth of hole decreased from 4,217 to 4,103 ft. for the country as a whole.

4. In 6 states (California, Indiana, Montana, New Mexico, Ohio, and Oklahoma) the average depth of hole increased, but in all the other 11 states where more than 25 exploratory holes were drilled in 1945, there was a decrease in the average depth per hole.

In former annual reports we have studied conditions in a group of 11 selected states. In the general review

TABLE 1—NUMBER OF OIL WELLS, GAS WELLS, CONDENSATE WELLS, AND DRY HOLES DRILLED AS EXPLORATORY TESTS IN 1945

States*—	Oil producers		Gas producers		Condensate producers		Total producers		Dry		Grand totals		Avg. depth of hole†
	No. of holes	Footage drilled	No. of holes	Footage drilled	No. of holes	Footage drilled	No. of holes	Footage drilled	No. of holes	Footage drilled	No. of holes	Footage drilled	
Alabama	1	3,461	1	2,005	0	0	2	5,466	20	91,833	22	97,299	....
Arizona	0	0	0	0	0	0	0	0	3	7,190	3	7,190	....
Arkansas	3	11,687	0	0	0	0	3	11,687	47	200,851	50	212,538	4,251
California	76	307,394	9	36,681	0	0	85	344,075	325	1,428,845	410	1,772,920	4,324
Colorado	0	0	0	0	0	0	0	0	11	64,775	11	64,775	....
Florida	1	11,597	0	0	0	0	1	11,597	13	87,046	14	98,643	....
Georgia	0	0	0	0	0	0	0	0	6	16,896	6	16,896	....
Illinois	79	207,142	0	0	0	0	79	207,142	418	1,002,987	497	1,210,129	2,435
Indiana	23	39,692	4	3,340	0	0	27	43,032	88	290,587	115	333,619	2,901
Kansas	83	276,206	24	88,339	0	0	107	364,545	375	1,365,157	482	1,729,702	3,589
Kentucky	27	44,742	11	22,770	0	0	38	67,512	132	233,826	170	301,338	1,773
Louisiana	46	350,523	15	83,662	10	83,720	71	517,905	164	1,198,684	235	1,716,589	7,305
Maryland	0	0	0	0	0	0	0	0	1	7,178	1	7,178	....
Michigan	20	55,430	12	27,553	1	5,198	33	88,181	323	795,349	356	883,530	2,482
Mississippi	10	67,940	0	0	4	38,214	14	106,154	115	817,564	129	923,718	7,161
Missouri	0	0	2	855	0	0	2	855	16	24,589	18	25,444	....
Montana	5	10,181	0	0	0	0	5	10,181	25	86,189	30	96,370	3,212
Nebraska	0	0	0	0	0	0	0	0	6	29,507	6	29,507	....
New Mexico	18	83,405	7	27,017	0	0	25	110,422	83	314,268	108	424,690	3,932
New York	0	0	3	9,156	0	0	3	9,156	17	56,468	20	65,624	....
Ohio	12	44,516	37	105,527	0	0	49	150,043	74	249,900	123	399,943	3,252
Oklahoma	78	385,824	16	54,067	0	0	94	439,891	343	1,489,721	437	1,929,612	4,416
Oregon	0	0	0	0	0	0	0	0	1	5,924	1	5,924	....
Pennsylvania	1	2,685	34	80,951	0	0	35	83,636	58	153,931	93	237,567	2,554
Tennessee	0	0	0	0	0	0	0	0	6	10,913	6	10,913	....
Texas	341	1,771,449	75	325,573	85	667,029	501	2,764,051	1,668	7,278,084	2,169	10,042,135	4,630
Virginia	0	0	0	0	0	0	0	0	1	802	1	802	....
Washington	0	0	0	0	0	0	0	0	4	14,783	4	14,783	....
West Virginia	0	0	20	87,270	0	0	20	87,270	21	89,063	41	174,333	4,252
Wyoming	16	59,924	4	18,977	0	0	20	78,901	35	115,654	55	194,555	3,537
Totals	840	3,733,798	274	973,743	100	794,161	1,214	5,501,702	4,399	17,528,564	5,613	23,030,266	4,103

*No exploratory drilling was reported in Iowa, Nevada, North Carolina, North Dakota, South Carolina, South Dakota or Utah.
†Averages have been recorded here only for states where more than 25 exploratory holes were drilled in 1945

TABLE 2—COMPARATIVE STATISTICS FOR SOUTHERN STATES SHOWN IN FIG. 2*

	Producers drilled				Dry holes drilled				Total number Explor. holes drilled	Total ft. drilled	Avg. depth of hole (ft.)	Number of dry-hole ft. drilled for each producer ft.
	Holes		Footage		Holes		Footage					
	No.	Per cent	Ft.	Per cent	No.	Per cent	Ft	Per cent				
1938	200	13.6	984,262	17.4	1,271	86.4	4,667,402	82.6	1,471	5,651,664	3,842	4.74
1939	161	12.6	779,345	14.8	1,113	87.4	4,501,669	85.2	1,274	5,281,014	4,145	5.90
1940	187	12.8	919,506	†14.9	1,279	87.2	†5,251,273	†85.1	1,466	6,170,779	†4,209	†5.71
1941	258	16.5	1,264,774	18.4	1,305	83.5	5,578,975	81.6	1,563	6,843,749	4,372	4.41
1942	231	16.3	1,289,480	19.6	1,186	83.7	5,295,556	80.4	1,417	6,585,036	4,647	4.11
1943	287	17.3	1,546,956	18.8	1,369	82.7	6,680,512	81.2	1,656	8,227,468	4,968	4.32
1944	473	21.1	2,804,005	23.5	1,765	78.9	9,095,421	76.5	2,238	11,899,426	5,317	3.24
1945	613	22.7	3,508,301	26.1	2,093	77.3	9,944.302	73.9	2,706	13,452,603	4,971	2.83

*In this table New Mexico data are from the southeastern part of the state only. †See Bull. A.A.P.G., Vol. 25, p. 1938, where corrections are mentioned for these figures as they appeared in Table 2, p. 1001, of the same volume.

Fig. 2

TABLE 3—BASIS FOR LOCATING EXPLORATORY HOLES DRILLED IN 1945

State—	Geology		Geophysics*		Geology and geophysics*		Sundry no. technical		Unknown		Totals		Grand total
	Prod.	Dry	Prod.	Dry	Prod.	Dry	Prod.	Dry	Prod.	Dry	Prod.	Dry	
Alabama	1	4	0	9	0	2	0	3	1	2	2	20	22
Arizona	0	0	0	0	0	0	0	3	0	0	0	3	3
Arkansas	2	29	1	8	0	4	0	4	0	2	3	47	50
California	73	195	1	40	10	34	1	56	0	0	85	325	410
Colorado	0	9	0	1	0	1	0	0	0	0	0	11	11
Florida	1	4	0	3	0	2	0	4	0	0	1	13	14
Georgia	0	0	0	0	0	2	0	4	0	0	0	6	6
Illinois	66	303	1	14	9	35	2	58	1	8	79	418	497
Indiana	22	47	1	13	2	8	0	7	2	13	27	88	115
Kansas	76	207	12	35	1	4	18	128	0	1	107	375	482
Kentucky	29	92	1	4	1	0	5	16	2	20	38	132	170
Louisiana	35	75	21	61	15	27	0	1	0	0	71	164	235
Maryland	0	0	0	0	0	1	0	0	0	0	0	1	1
Michigan	32	268	1	9	0	0	0	25	0	21	33	323	356
Mississippi	2	21	7	69	5	16	0	1	0	8	14	115	129
Missouri	2	1	0	0	0	0	0	13	0	2	2	16	18
Montana	4	15	0	2	1	1	0	7	0	0	5	25	30
Nebraska	0	0	0	1	0	0	0	4	0	1	0	6	6
New Mexico	18	45	1	12	2	8	1	4	3	14	25	83	108
New York	2	16	0	0	0	0	1	0	0	1	3	17	20
Ohio	22	24	0	2	0	0	1	8	26	40	49	74	123
Oklahoma	41	195	29	73	12	22	2	10	10	43	94	343	437
Oregon	0	1	0	0	0	0	0	0	0	0	0	1	1
Pennsylvania	23	33	0	2	0	2	9	7	3	14	35	58	93
Tennessee	0	5	0	0	0	0	0	1	0	0	0	6	6
Texas	355	1,198	66	191	77	149	0	27	3	103	501	1,668	2,169
Virginia	0	0	0	0	0	0	0	0	0	1	0	1	1
Washington	0	0	0	0	0	0	0	0	0	4	0	4	4
West Virginia	12	10	0	0	0	0	7	11	1	0	20	21	41
Wyoming	15	30	0	1	5	2	0	2	0	0	20	35	55
Totals	833	2,827	142	550	140	320	47	404	52	298	1,214	4,399	5,613

*Including geochemistry.

of all our previous reports, we compared statistics for a group of 17 states. Each year, from 1938 to 1945, inclusive, these 17 states have included 98 per cent of the proved oil reserves of the country. For this reason their study gives essentially a picture of conditions in the United States where we want to compare exploration activities and additions of new oil from year to year.

In Table 4 is presented an analysis of the five classes of exploratory hole, and this is done both for the 17-state area and for the entire United States. Observe that the percentages for both areas are very nearly the same for each year. This, of course, would be expected since so much of the exploratory drilling of the country occurs in these 17 states. If we wished to use round numbers for averages between these 2 years of 1944 and 1945, we might say that new-field wildcats constitute about 60.4 per cent of all the exploratory holes drilled; outposts about 18 per cent; new-pool wildcats about 15 per cent; deeper-pool tests about 6 per cent; and shallower-pool tests about 0.6 per cent. Together, then, the new-pool tests (the last three) would constitute 21.6 per cent of the total. Or we may say that exploratory drilling is roughly divisible into 60 per cent wildcatting for new fields, 20 per cent drilling for new pools on structures already producing, and 20 per cent is outpost drilling for long-distance extensions of pools already partly developed.

A question sometimes asked concerns the approximate percentage of true wildcatting (new-field wildcatting) by major companies, on the one hand, and by minor companies and independents, on the other hand.

Statistics showed that in the country as a whole, 894 new-field wildcats (158 producers and 736 dry holes) were drilled by majors; 1,854 new-field wildcats (165 producers and 1,689 dry holes) were drilled by minors and independents; and 288 new-field wildcats (28 producers and 260 dry holes) were drilled by minors or independents with the drilling financed by major companies. Corresponding figures for the 17-states area were 843 new-field wildcats (150 producers and 693 dry holes) by majors; 1,783 new-field wildcats (157 producers and 1,626 dry holes) by minors and independents; and 287 new-field wildcats (28 producers and 259 dry holes) by minors and independents with the drilling financed by majors.

TABLE 4—DISTRIBUTION OF EXPLORATORY WELLS OF 1944 AND 1945 BY CLASSES AND RESULTS OF DRILLING

	17-States area						All states reported					
	1944			1945			1944			1945		
Outposts:	No.	Well per cent	Class per cent	No.	Well per cent	Class per cent	No.	Well per cent	Class per cent	No.	Well per cent	Class per cent
Producers	286	42.37	.....	424	38.09	.....	315	41.72	.....	480	39.57	.....
Dry holes	383	57.63	.....	689	61.91	.....	440	58.28	.....	733	60.43	.....
Totals	669	100.00	14.70	1,113	100.00	21.07	755	100.00	15.74	1,213	100.00	21.61
New-pool wildcats:												
Producers	158	24.30	.....	207	25.30	.....	179	25.35	.....	236	26.14	.....
Dry holes	492	75.70	.....	611	74.70	.....	527	74.65	.....	667	73.86	.....
Totals	650	100.00	14.29	818	100.00	15.49	706	100.00	14.51	903	100.00	16.09
Deeper-pool tests:												
Producers	87	44.84	.....	106	26.56	.....	90	41.86	.....	114	27.08	.....
Dry holes	107	55.16	.....	293	73.44	.....	125	58.14	.....	307	72.92	.....
Totals	194	100.00	4.26	399	100.00	7.55	215	100.00	4.48	421	100.00	7.50
Shallower-pool tests:												
Producers	17	73.92	.....	32	82.06	.....	18	69.24	.....	33	82.50	.....
Dry holes	6	26.08	.....	7	17.94	.....	8	30.76	.....	7	17.50	.....
Totals	23	100.00	.51	39	100.00	.74	26	100.00	.54	40	100.00	.71
New-field wildcats:												
Producers	330	10.95	.....	335	11.50	.....	342	11.03	.....	351	11.37	.....
Dry holes	2,684	89.05	.....	2,578	88.50	.....	2,752	88.97	.....	2,685	88.63	.....
Totals	3,014	100.00	66.24	2,913	100.00	55.15	3,094	100.00	64.73	3,036	100.00	54.09
Total producers	878	19.29	.....	1,104	20.90	.....	944	19.68	.....	1,214	21.63	.....
Total dry holes	3,672	80.71	.....	4,178	79.10	.....	3,852	80.32	.....	4,399	78.37	.....
Grand total	4,550	100.00	100.00	5,282	100.00	100.00	4,796	100.00	100.00	5,613	100.00	100.00

WASHINGTON WATCHING

BY HENRY D. RALPH

Oil Decontrol Assured By Amendment

WASHINGTON.—An amendment making it virtually certain that price control will be lifted from petroleum was written into the stabilization act by the House committee on banking and currency last week when it reported the bill to continue the Office of Price Administration 1 more year.

The amendment requires the president to certify at least once each month what commodities and classes of commodities are currently being produced in sufficient quantities to meet domestic demands, and OPA is then required to remove price ceilings within 10 days. Ceilings could be slapped on again later if things got out of control.

That was only one of a series of diluting amendments made by the committee but, if honestly administered, it ought to do the trick at least as far as crude oil is concerned. This amendment has so much support in Congress that OPA may see the handwriting on the wall and speed up its announced plan to "decontrol" petroleum prices this summer.

OPA took quite a beating in the committee but a worse one is in store when the bill reaches the floor of the House. That body has been sharpening knives for OPA for some time, and when the bill goes to the Senate it will be highly unsatisfactory to the administration. What the Senate may do to it no one knows, but President Truman can't veto the bill or OPA will die June 30 and there will be no semblance of price control.

As the bill now stands, OPA is continued until June 30, 1947, but Congress goes on record that its life will not be further extended beyond that date. On April 1, 1947, the president is to report to Congress what commodities, if any, still need price control, and Congress will then, presumably, enact a new law giving such controls to other agencies of the Government. The theory is that practically everything will have been decontrolled by that time.

Cigarets may set the pattern for oil prices. OPA is currently studying a request of cigaret manufacturers for a price increase, based on higher costs of raw materials and labor, and reduced earnings. OPA admits there is no shortage of cigarets any more. By the yardstick of supply and demand there is no further need for price control. But OPA knows that prices would rise a little if the ceiling were removed, and this, of course, would be inflationary and bad for consumers. So it has been stalling and trying to find a way to make distributors absorb the increase. There is a parallel in crude oil, where supply and demand are in balance but prices would go up a bit if controls were removed, so OPA may try to squeeze refiners some more. The cigaret decision is due any day now, but further action on oil prices probably can be stalled by the device of further studies of data submitted by the crude-oil and refining-industry advisory committees. Congressman Wright Patman of Texas is still needling OPA for more action on oil prices. His latest letter to that agency reminds it that it has authority to decontrol commodities where supply and demand are in balance, and he asks why OPA must wait until June 30, or later, to eliminate the crude-oil ceiling.

Senate Committee Ready For Tidelands Vote

THE tidelands oil issue will be in the news again soon. The Senate judiciary committee is now ready to vote a favorable report on the resolution, already passed by the House, to foreswear all federal claims to submerged lands and quiet the titles of the respective states. But it doesn't want to take such action until it is reasonably sure that the Senate has forgotten the row over the nomination of Edwin W. Pauley to be Undersecretary of the Navy and the California oilman's connection with the tideland controversy. If it looks as though this issue would be kicked up again, the committee may wait a while before bringing the resolution to the Senate floor.

Meanwhile the State of California has complained to the Supreme Court over the request of the Department of Justice to have the state's 822-page answer stricken from the records of the tidelands suit. The Department of Justice said the answer was "prolix," a legal term meaning, roughly, too long to bother to read. State Attorney General Robert W. Kenny told the Court that since the government attorneys have caused the states so much trouble with this suit they should at least be forced to read the answer. Apparently neither the Department of Justice nor the Supreme Court is making any rush to settle the case before the Senate acts.

TEL Limitation Order Finds Refiners Off Guard

THE severe limitation of use of tetraethyl lead ordered by Civilian Production Administration was entirely unexpected by the refining industry in spite of CPA warnings that all lead users faced a curtailment.

For the month of April refiners are held to 27 per cent of the amount of ethyl fluid they used during the "base period" of November and December 1945, and January 1946. Furthermore, no ethyl may be used in making motor gasoline of more than 80 octane nor aviation gasoline of more than 100 octane without special permission from CPA.

Virtually all lead uses were curtailed, the over-all cut being approximately 10 per cent below the first quarter of this year, but allocations for other uses were made for the entire second quarter, while tetraethyl lead is covered by a new order (L-355) which provides only for the month of April. This means that the order will be amended by May 1, and CPA officials have indicated that the next order may be more severe rather than easier.

In the meantime spokesmen for the oil industry plan to put up a bitter battle with CPA in the hope of getting the order liberalized. Some of the arguments they will use are:

By taking the three winter months as the base period, CPA took the 3 months of lowest gasoline production and cut below that for application to a period of expanding demand.

The gasoline industry uses a comparatively small volume of lead but that small quantity is highly important to the motorist.

The quality of motor gasoline will deteriorate to the low grades of wartime; motors will knock, and motorists will kick.

The order works a particular hardship on small refiners without catalytic-cracking equipment and favors those few refineries which can make high-octane gasoline without lead.

Independent marketers will suffer because the bulk of their profits comes from the margin on the sale of premium gasoline.

CPA said that the demand for lead during 1946 is about 1,040,000 tons, while supply is estimated at only 860,000 tons. It therefore fixed second quarter allocations at 230,000 tons, compared with 257,000 tons the first quarter.

Public Lands Bill May Be Amended

AN amendment to their jointly authored public lands bill has been proposed by Senators O'Mahoney of Wyoming and Hatch of New Mexico to provide a flat royalty of 12½ per cent on all oil or gas produced from new deposits on public lands. This would replace the sliding scale of royalties which the Interior Department instituted some years ago and which has been opposed ever since by oil producers. The bill itself (S. 1236) makes a number of other changes in oil and gas leasing provisions and is still lying in the Senate public lands committee.

Commerce Department's Oil Activities Expanding

THE oil activities of the Department of Commerce are being expanded in connection with the gradual but thorough reorganization of that agency. James H. Mayes now heads the petroleum section of the commodities branch of the office of world trade promotion of the Department of Commerce. Mayes formerly was engaged in oil marketing in Europe and Latin America and in production in Venezuela, and during the war was in the office of export control.

How large the new section will be and what services it will render the industry will depend largely on what kind of a budget the department gets and what requests the industry makes of it. The hope is to collect comprehensive and detailed information on international petroleum developments, and particularly to furnish the industry with data on foreign markets for petroleum products. The department's foreign reporting service is being built up, and it hopes to get an increasing volume of information from petroleum attaches, commercial attaches, and consular officers throughout the world.

Doubling of the foreign service personnel engaged in commercial and economic work abroad to further aid American business has been recommended to the secretaries of State and Commerce by an advisory committee of business men, one member of which is H. F. Sheets, chairman of Socony-Vacuum Oil Co., Inc. An appropriation bill soon to be acted on by Congress calls for 500 foreign-service officers engaged in commercial and economic work abroad, and the committee reported that twice this number will be required to give American business men the information and assistance they need in re-establishing their foreign markets. The group also recommended that commercial qualifications and practical business background carry more weight in the selection of foreign-service officers.

CPA Increases Use of Natural Rubber in Tires

INCREASED shipments of rubber from the Far East have allowed Civilian Production Administration to authorize a 50 per cent increase in the amount of natural rubber used in tires and certain other products. The monthly consumption of natural rubber is now 15,500 long tons per month, and natural rubber now constitutes 20, instead of 15, per cent of all rubber going into new products. Truck and bus tires will get most of the additional rubber, which should make them stand up better than the wartime grades. Passenger-car tires are still 97.5 per cent synthetic.

However, this won't relieve the demand for synthetic rubber or butadiene to make it. Working inventories of rubber are going down, and synthetic-rubber plants will be kept operating up to the capacity of the petroleum industry to supply butadiene.

Although this country is counting on getting close to 300,000 long tons of natural rubber this year, the outlook for the future is not bright, according to a report of the Department of Commerce. This points out that shipments will decline from areas which supplied us rubber during the war, and there are too many uncertainties to predict the volume of shipments from the large prewar producers. Even if political conditions are straightened out the rubber workers won't produce much until they have the inducement of cotton cloth, small hand tools, personal articles, and other commodities, in addition to more rice, the report says, and it may be a long time before such goods can reach the Far East in volume. Meanwhile, Reconstruction Finance Corp. has agreed with the British, Dutch, and French Governments to continue until June 30, 1946, the current price of 20¼ cents per pound for natural rubber, f.o.b. Far East ports.

Strang Takes Post With Institute's Oil Division

William H. Strang, former Continental Oil Co. engineer who was recently placed on inactive duty after more than 4 years' Army service, has been made executive secretary of the petroleum division of the American Institute of Mining and Metallurgical Engineers.

WILLIAM H. STRANG

He fills a post vacant since June 1945, when Chester Naramore, former executive secretary, resigned. Herbert F. Beardmore, chairman of the division, said offices will be established in Dallas to provide the division with an administrative point convenient to major producing areas. Formerly the executive secretary functioned from the New York City headquarters of the institute.

Educated in petroleum production engineering at Colorado School of Mines and University of Oklahoma, Strang was associated with Continental Oil and later as Gulf Coast editor of Oil Weekly. He was separated from the service as a lieutenant colonel in the Ordnance Department after service in Europe.

The selection of an executive secretary and establishment of separate offices for the division, Beardmore said, are the first steps in a program to expand the activities of the division and to assist the regional sections in producing areas throughout the country.

Lion Oil's Chemical Unit Leases Ordnance Plant

LITTLE ROCK. — Lion Chemical Corp., a subsidiary of Lion Oil Co., has taken a 5-year lease on the Government - owned Ozark Ordnance Works near El Dorado, Ark., and will spend $1,000,000 to convert the plant to the manufacture of fertilizer.

The conversion work will require about 6 months. The plant occupies 599,365 sq. ft. Lion Chemical arranged the lease with War Assets Administration.

Noble Elected A.A.P.G. President; Eastern Section Is Organized

by Charles J. Deegan

CHICAGO. — Winding up a 5-day annual meeting, the American Association of Petroleum Geologists embarked on a new year of activities in charge of the new officers, all of whom were elected without opposition. Earl B. Noble, manager of exploration department, Union Oil Co. of California, is the new president. Other officers are: D. Perry Olcott, Humble Oil & Refining Co., Houston, vice president; Edward A. Koester, Darby & Bothwell, Inc., Wichita, secretary-treasurer, and Gayle Scott, Texas Christian University, Fort Worth, editor.

Two important steps were taken by the association, throwing its full weight behind the national trend to organize scientists and technologists, so that their opinions can be mobilized and expressed in matters of national welfare and security. It ratified the constitution of the American Geological Institute. This will be a confederation of all geological societies, which can speak with an authoritative voice in expressing the opinion of all American geologists on questions of national policy that are important to geologists.

The second step was to affiliate the association with the American Association for the Advancement of Science. Through this affiliation, the petroleum geologists will see that petroleum geology is properly considered in the broad field of science, and can join effectively with all other scientific organizations in presenting their views on national policies in fields that are broader than those affecting geology alone.

Tribute Paid to Committee

Among internal business matters considered, there were also two steps that stood out. The distinguished lecture committee, because of its outstanding record, has been established as a permanent standing committee of the association. This was generally regarded as a tribute to the outstanding work of two men, Fred H. Moore, Magnolia Petroleum Co., Mt. Vernon, Ill., and John L. Ferguson, Amerada Petroleum Corp., Tulsa.

The second important internal change was the establishment of an eastern section of the association, which will provide members in that part of the country with a more efficient method of expressing their views on general policies. In some quarters this was viewed as significant, possibly arising out of the noticeable industry tendency to promote geological executives and advisers to higher posts in the administrative and policy-making councils of oil companies and financial concerns.

Many of the geologists in attendance stayed over for the field trip on Friday, which was under the auspices of the Illinois Geological Society, and took in many points of special geological interest.

Settlement Reached in Hughes Tool Dispute

HUGHES TOOL CO., a major manufacturer of drilling bits and other oil field equipment, and the C.I.O. steelworkers union reached a settlement in Houston early this week to end a 77-day walkout.

Renewed negotiations to end the drawn-out dispute were initiated last week after Noah Dietrich, executive vice president of the company, met in Washington with Philip Murray, C.I.O. head and steelworkers union president.

Terms of the agreement included: an immediate 17-cent hourly wage increase in all classifications; holding of a National Labor Relations Board election within 6 months to determine what union holds a majority for bargaining; elimination of intra-plant job inequities, and "such further wage adjustments . . . to cure such inequalities;" and a 1-cent hourly increase in shift differentials.

Recall of the workers was to begin Tuesday. Originally 4,000 workers struck at the plant, but since then many have returned. The settlement was said to represent a compromise of the union and management positions.

Members of the International Association of Machinists at the Houston plant of Well Equipment Manufacturing Corp. returned to work last week after an 11-day walkout. Under the settlement a National Labor Relations Board election will be held among the employes.

Earlier, C. K. Stillwagon, president of the company, corrected what he described as "propaganda from one side of the question" and asserted only 47 employes had been affected by the strike instead of 75 to 90. Union contentions that three men were discharged for union activities were denied by the company head.

The C.I.O. oil workers' union this week turned its attention to negotiations in New York with Sinclair Oil Corp. for a renewal of the company's contract for five subsidiaries. In Fort Worth, O. A. Knight, union president, said the contract was one of the most important considered since the oil workers' strike last autumn.

Approximately 9,000 workers will be affected by the negotiations. The union has had a national agreement with Sinclair since 1934, and the present contract expires June 1.

A fair solution to disputes between labor and management which will "mark the beginning of an era of great prosperity," was foreseen last week by William F. Humphrey, president of Tide Water Associated Oil Co. In his annual report to stockholders, Humphrey said some industrial leaders are "too pessimistic" on the labor situation.

Discussion of the earnings of workers in the oil industry was heard in Congress last week. In arguing the minimum wage bill, Senator Morse of Oregon cited figures of Bureau of Labor Statistics showing straight-time hourly earnings of oil-industry workers average 143.7 cents an hour —higher than four other major industries and 46.7 cents an hour above the rate on January 1, 1941.

Gasoline Tax Yields High In Oklahoma and Texas

Officials of two southwestern states, Texas and Oklahoma, are reporting statistics which show record yields from gasoline taxes.

In Oklahoma City, state officials are predicting the special 2-cent gasoline tax enacted by the 1943 legislature will net the state more than $11,000,000 before it expires December 31.

The additional levy made Oklahoma's tax the highest in the United States—7½ cents. Oklahoma motorists pay this plus the 1½-cent federal tax. Revenue from the increased 2-cent tax was earmarked for state and county roads, and officials expect it will be matched by federal funds.

Texas officials in Austin reported civilians bought more gasoline in the state than in any February in history. While tax-free purchases by the Government in Texas declined from 242,917,753 gal. in February 1945, to 25,424,496 gal. last February, civilian consumption was shown at 120,617,198 gal. compared with 96,511,421 gal. a year ago. Texas' 4-cent tax produced $5,253,941 in February.

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NEWS FROM FOREIGN OIL COUNTRIES

Oil Men Apprehensive Over Terms Of Russo-Iranian Concession

OIL men are wondering just what long-range significance should be attached to the announced terms of the proposed oil concession to be granted by the Iranian Government to Russia applying to part of Northern Iran. Official reports indicate that the 50-year concession is to be developed by a jointly owned corporation, during the first 25 years of which the Russians will own 51 per cent, the Iranian Government 49 per cent, while during the last 25 years, the participation will be 50 per cent for each party.

The official statements further indicate that supplying the land in the concession will constitute the Iranian contribution of 49 per cent of the initial capital, while the exploration and development expenses will all be borne by Russia. This is merely a statement of principle, and detailed contracts may alter the original interpretation of this considerably from the manner in which American and British oil men would be inclined to interpret its meaning.

This is the first indication of the official policy of the Iranian Government toward oil concessions since 1943, when, as a result of Russia's request for an oil concession in Northern Iran, the Iranian Government officially announced that no additional concessions would be granted to anyone until after the war. American and British oil companies were seeking concessions at that time.

The official announcement merely states six general points: (1) The formation of a joint company, with the 51-49 per cent ownership for the first 25 years, and the 50-50 per cent during the second 25-year period; (2) division of profits according to the above percentage ownership; (3) and very important to oil men, a vague reference to the boundaries as defined on an unpublished map that was part of the negotiations; (4) that the supplying of "specified oil-bearing land" shall be the Iranian capital contribution, while the Soviet capital contribution "will consist of all kinds of expenses, equipment, wages of specialists and workers who will be necessary for production and processing the oil"; (5) the term of the joint company's existence will be 50 years; and (6) that after the company's tenure expires, the "Iranian Government will have the right of buying out the shares of the Soviet side, or prolonging the period of the company's existence."

Concession's Boundaries

The concession is reported to extend across northern Iran from intersection of frontiers of Iran, Afghanistan, and Soviet Turkmen Republic in east to intersection of Soviet Union, Turkish, and Iranian Azerbaijan frontiers in west. From east to west the demarcation line proceeds from Iran-Afghanistan-Turkmen intersection northwestward to a point north of Meshd; westward through Quchan, Miyanabad, and Nardin; southwestward to Aberskash; southward down the fifty-fifth meridian, east longitude to 34.15° latitude. Then westward to fifty-third meridian longitude; northward through Chah-Dzhangie, Semek, and Khank-Kela; westward through Taprusteh, Natir, Holar, Ambaluh, Masuleh, and Hilyevan; southwestward to Miyanduab, which is 75 miles southwest of Tabriz and 25 miles south of southern tip of Lake Urmia. (Note: Lake Urmia and Lake Rezeje are different spellings for same lake). Boundary line then follows eastern shore of lake to its northernmost tip and swings northwestward to a point just south of Yerevan where Turkish, Soviet Union, and Iranian frontiers meet. Line passes 75 miles north of Tehran. Whether Kazvin and Caspian seaports of Resht and Bandashar are included in concession seems in doubt but indications here are that they are.

While there have been rumors recently of oil being found in northern Iran, the object of the present concession, there is no official confirmation, and many informed people are inclined to discount these reports. For one thing, it is pointed out that only the Russians have been in a position to drill any wildcat tests since the last public information available. The Russians, on the other hand, had no legal right to do any such work. Furthermore, it is generally thought that the Soviets had more immediately urgent uses for all drilling equipment available during the war.

The southern part of Iran has six oil fields, producing about 385,000 bbl. daily from 51 active wells as of January 1, 1946, all owned by Anglo-Iranian Oil Co., Ltd., which is owned 56 per cent by the British Government, 26 per cent by Burmah Oil Co., Ltd., and 18 per cent by individuals. The Anglo-Iranian's concession covers 100,000 sq. mi. of the country's total 628,000-sq. mi. area. Hence not only is the Anglo-Iranian's concession only partly explored, but the other five-sixths of the country has had no development. At Abadan, at the head of the Persian Gulf, Anglo-Iranian Oil Co. operates the largest refinery in the world, with daily crude capacity of 385,000 bbl.

Whether the new Russian concession will mean that new concessions will now be available to American or British companies, and on what terms, remains to be seen. It is known that several companies have been interested in obtaining concessions on a basis comparable with the terms of the Anglo-Iranian concession which is similar to those in effect in other oil-producing countries outside the United States.

Equipment for Russia Under UNRRA Reported

WASHINGTON.—Attempts to purchase drilling and refining equipment for Russia through the United Nations Relief and Rehabilitation Administration are reportedly being made by the procurement division of the U. S. Treasury Department.

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The division is said to have approached several manufacturers about the feasibility of such purchases. An UNRRA official denied any equipment had been sent or programed, but would make no statement as to whether the negotiations are under way.

The report is the latest of several dealing with Russian purchases of oil-field and refinery equipment in the United States. Several weeks ago in New York it was said Russia had ordered in this country pipe for a line reaching from the U.S.S.R. to fields in the Balkans.

One source here declared the UNRRA purchases already had been made, despite the policy of the agency that goods furnished shall be solely for the relief of war-ravaged countries while commerce is being built up and not for luxury or export material. Six refineries constructed in Russia under lend-lease and valued at between $60,000,000 to $70,000,000 are now practically complete. Equipment was purchased in the United States and paid for by the Treasury Department's procurement division.

Note Demands Russians Quit Hungarian Fields

WASHINGTON. — Soviet evacuation of American oil property in Hungary has been demanded in a note which was presented to Russian army officials by the American military mission on instructions from the State Department.

According to reports here, the note pointed out that the matter of Russian evacuation of the fields has been taken up by the American embassy in Moscow. The State Department March 5 instructed Maj. Gen. William Key, American member of the Allied Control Council for Hungary, to make the demand in note form. General Key delivered the note to Soviet Marshal Klementi Voroshilov March 22. Text was not available here.

Major American company involved is Standard Oil Co. (N. J.) Earlier reports from Budapest said the Lispe field is suffering heavy damage as a result of Russian operating methods of producing above rates dictated by best conservation practices.

Iranian Oil Production Averages 400,000 Bbl. Daily

Crude-oil production in Iran for December 1945 amounted to 1,622,000 tons (approximately 12,354,000 bbl.), compared with 1,596,000 tons (approximately 11,172,000 bbl.) for November, according to B. R. Jackson, United States representative for Anglo-Iranian Oil Co., Ltd.

Total production for 1945 was 16,839,000 tons (approximately 123,873,000 bbl.) compared with 1944's total of 13,274,243 tons approximately 92,919,701 bbl.)

Figures on Iran's wartime production which were withheld until recently appeared in the March 16 issue of the Journal, page 65.

Murphree Tells Venezuelans Atomic Competition Unlikely

CARACAS. — Another prediction that the oil industry need have no fear of immediate competition as a power source from atomic energy was made here by E. V. Murphree, Standard Oil Development Co. official who was closely associated with the wartime atom bomb project in the United States.

In his discussion, Murphree detailed economic considerations involved in a comparison between the atom and oil as a source of energy. One practical aspect of any atomic power machine is the huge shield necessary. This would weigh many hundreds of tons, he said.

Recently named executive vice president of Standard Oil Development, Murphree was in Venezuela consulting with officials of Creole Petroleum Co., another affiliate of Standard Oil Co. (N.J.). Among the subjects under discussion was the new $50,000,000 refinery planned by Creole in Venezuela.

Although not discounting that for some purposes atomic energy might eventually become as adaptable and economical as oil, Murphree said that its use for plants, cars, and similar mobile equipment is "wholly impractical on the basis of what we know today."

In the case of a ship of the size of the Queen Mary, however, he said, even with a shield weighing as much as 1,000 tons, the vessel would gain a considerable saving in weight through use of an atomic machine. The Queen Mary, he pointed out, starts her voyages with 6,000 tons of fuel oil.

A pound of pure uranium can probably be produced for about $40,000 to $50,000, but even at this high price atomic energy, theoretically, can compete with oil on a cost basis, he said. The heat value of a pound of pure uranium 235, when released by atom splitting, is more than 2,000,000 times greater than the heat value of a gallon of gasoline. On this theoretical basis, the cost of uranium 235 would be equivalent to the cost of gasoline at 16 cents a gallon.

"An atomic energy machine would not necessarily need to use the expensive uranium 235. It could use normal uranium which contains a small amount of 235, about 7 parts in 1,000, or the equivalent of 42 bbl. of of fuel oil in terms of heat. Normal

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uranium costs about $8 a pound, so on this basis, its cost would be equivalent to 19 cents a barrel for fuel oil which costs more than $1.

"However, the atomic machine may use only 60 per cent of the uranium 235 contained in normal uranium before the reaction that produced the heat would be stopped by impurities. Therefore, the cost would likely be equivalent to 30 cents a barrel. This, however, is theoretical, since it assumes an efficiency in utilizing the atomic reaction that has not yet been obtained. . . ."

Atomic reactions, Murphree said, do not need to be violent. Such a reaction was desired in atomic bombs, but the same reaction, he added, can be closely controlled so that atomic energy is released as required and can be used constructively.

French Seeking to Halt Spanish Oil Shipments

PARIS.—Among topics slated to be discussed at the proposed April 25 meeting of the Council of Foreign Ministers, in Paris, is the subject of oil sanctions against General Franco's Spanish regime. Late last month the French Government, for the third time, formally suggested to the British, United States, and Soviet ambassadors that plans to halt oil shipments to Spain be enacted in an effort to force Franco out of power.

Ecuador's 1945 Production Shows 9 Per Cent Decline

WASHINGTON.—Although production declined about 9 per cent, Ecuador increased its exports of crude petroleum more than 11 per cent last year with Canada as its largest customer.

The country's crude production dropped from 2,892,188 bbl. in 1944 to 2,622,724 bbl. in 1945. Exports, however, increased from 1,905,959 bbl. in 1944 to 2,118,323 bbl. in 1945. Canada took 60 per cent of the export volume, Argentina 21 per cent, and Uruguay, 18 per cent.

In refinery operations, Ecuador increased its production of gasoline from 212,731 bbl. in 1944 to 225,984 bbl. in 1945. Lubricating oil production, however, dropped sharply from 3,844 bbl. in 1944 to 1,790 bbl. in 1945. During 1945, a total of 2,475,113,000 cu. ft. of natural gas was processed for a production of 41,768 bbl. of gasoline, against 2,273,519,000 cu. ft. for 38,408 bbl. in 1944.

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Venezuela's Most Ambitious Exploratory Campaign in History Well Under Way

by Marian C. Cody

This summary of wildcat activity in Venezuela is furnished by the Journal's editorial representative in Caracas. A total of 37 wildcat operations is currently reported, with the bulk being in eastern Venezuela. At the end of the article is a tabulation of the wildcats, their locations, and status at the time the article was written.

CARACAS.—The extensive exploration program set by Venezuelan oil companies for 1946 and which is the most ambitious in the history of Venezuelan operations is well under way with 37 wildcat operations reported. Since beginning of the year three wells have been completed for oil producers and possible new field openers, with the possibility that two other wells have discovered new production. One well was completed as a gas producer. Four wells have been reported dry and abandoned and 28 wells are currently being drilled.

The bulk of the wildcat activity is centered in Eastern Venezuela, with the Maracaibo basin area, Central Venezuela principally the state of Guarico, and the Apure basin area in southwestern Venezuela following in importance.

In eastern Venezuela, the Mene Grande Oil Co. has made three important discoveries which promise to materially increase the ever-expanding producing area in that region.

Eastern Venezuela

Mene Grande holds the spotlight among the companies with three discoveries in the last 3 months. Meneg 1 Caico-Seco (referred to as CaM 1) is the most important of the three new discoveries. The well was completed January 14 with an initial production of 515 bbl. per day of 49.7-gravity oil through a ¼-in. choke, producing from the Oficina formation of Mio-Oligocene age. Total depth was 8,515 ft. The well is approximately 30 kilometers (18½ miles) northwest of the main Oficina field. Caico 1 is a particularly important discovery because of its large initial production and high gravity of oil together with the fact that it appears to open a new trend between the established Oficina-Guara - Leona and the Santa Ana-San Joaquin-Guario trends.

Tending to confirm the existence of a new trend as suggested by 1 Caico, a second wildcat has been completed as a producer, 1 Nipa (Mene Grande NG 1). Nipa 1 was completed December 18 at a total depth of 9,164 ft. Initial production, from the Oficina formation, was 391 bbl. per day of 37.5-gravity oil through a ⅜-in. choke. Nipa 1 is located approximately 20 kilometers north of the main Oficina field.

Mene Grande's third discovery, GM 4, approximately 10 kilometers north of the main Oficina field, was completed February 19 as a dual zone producer. Initial production gaged 360 bbl. per day of 38.5-gravity oil through a ¼-in. choke from the upper zone; 372 bbl. per day of 36-gravity oil through a ¼-in. choke from the lower zone. Total depth is 7,077 ft.

Another well which is being watched with considerable interest is Mene Grande 2 Nipa (NG 2) which is about 10 kilometers due east of the discovery well, 1 Nipa. At the present time the well is drilling below 8,311 ft.

The second well in the Caico-Seco area is 2 Caico (CaG 1), spudded January 17 and located 750 meters south of the discovery well, 1 Caico.

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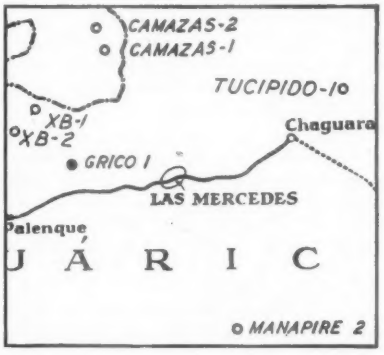

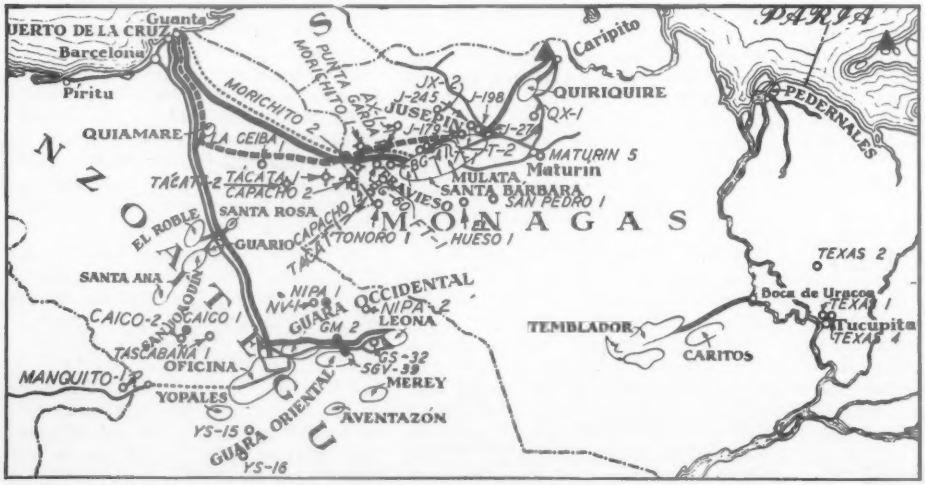

Above: Active wildcat operations and their relation to the Las Mercedes pool in the State of Guarico, central Venezuela

Left: Map showing extensiveness of the exploratory drilling campaign in the eastern part of Venezuela. Search for new production is particularly intensive around the greater Jusepin area which embraces the Mulata, Santa Barbara, Jusepin, and Muri fields

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Mene Grande reports the well drilling ahead at 7,676 ft.

Other wildcats being drilled in the vicinity of the Oficina field are Socony 1 Nipa (NV 1), 2 kilometers west of Meneg 1 Nipa discovery, and SGV 39, a semiwildcat offsetting Meneg 4 GM. Nipa 1 (NV) is drilling at 5,606 ft.; 39 SGV is drilling at 919 ft.

Socony completed 1 Tascabaña, 10 kilometers east of Meneg 1 Caico for a small gas producer at total depth of 7,950 ft.

Barnsdall Attempts Oficina Extension

Barnsdall has started drilling its first test for Venezuelan production on a western extension of the Oficina trend. The wildcat is about 12 kilometers west of the town of Pariaguan, or about 50 kilometers west of the Oficina field. The well is being called 1 Manguito, and was spudded February 13. This well is being followed with considerable interest.

Northern Monagas

Immediately west of the Santa Barbara field Mene Grande has attempted to extend the producing area with BG 60. After numerous attempts at completing for a producer, the rig was moved off and the well temporarily suspended at 6,200 ft. Another rig will be moved to this location in the near future and operations resumed.

Thirty-five kilometers west of the town of Santa Barbara, Mene Grande abandoned 1 Tácata January 29 after drilling to 8,629 ft. Tácata 2, located 8 kilometers west of 1 Tácata, is drilling at 3,805 ft. The well was spudded February 4.

Mene Grande 1 La Ceiba, on the general trend of the northern Monagas fields, but actually in the state of Anzoategui, about 35 kilometers east of the town of San Mateo, is continuing testing at 9,244 ft.

Atlantic Active in Northern Monagas

The Venezuelan Atlantic Refining Co. has been the most active operator in drilling rank wildcats in northwestern Monagas, most of which have been drilled on concessions of the Pantepec Oil Co. During the latter part of 1945, Atlantic drilled three wells, 1 Punta Gorda, 1 Morichito, and 2 Morichito. All were dry and abandoned.

Currently Atlantic is drilling four wildcats: 1 San Pedro, about 25 kilometers southeast of the Jusepin field; 1 El Hueso, which is approximately 15 kilometers west of the San Pedro well; 1 Tonoro, 40 kilometers west of 1 El Hueso; and 1 Tacat, about 3 kilometers east of Creole 1 Capacho, a 1945 discovery well.

Last reports indicate that 1 San Pedro is drilling at 6,555 ft.; 1 El Hueso is down to 6,150 ft.; 1 Tonoro is reported at 7,120 ft., and 1 Tacat is drilling ahead at 5,045 ft. All of these wells are being closely followed since the objective horizons are being approached, and the extensive coverage will furnish much information concerning the possible extension of the Jusepin-Santa Barbara trend to the west and south.

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Phillips Venezuelan Oil Co. may have discovered a new pool by its first wildcat in the general area now being explored by Atlantic. Immediately east of Atlantic 1 Tacat and 1 Tonoro, and two kilometers south of Mene Grande BG-60, Phillips has cored oil sand in FT-1. Oil sand was cored from 4,675 to 4,702 ft. in the La Pica formation.

The unusually heavy concentration of wildcats now being drilled by Mene Grande, Atlantic and Phillips, in an attempt to extend the prolific Santa Barbara-Jusepin area, is expected to supply a fairly conclusive evaluation of the potentialities of that area.

Other Wildcats in Northern Monagas

Other wildcats reported in northern Monagas are Creole JX-2, 15 kilo-

(Continued on Page 79)

Western Venezuela, including the Barinas district. Some of the new exploratory work west of Lake Maracaibo is attracting particular attention

ANOTHER

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NORMAL HEPTANE FROM PETROLEUM

PROPERTIES

(Current Production)

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DISTILLATION TEMPERATURE	209 F
DENSITY OF LIQUID, at 20 C	0.6839 g per ml
REFRACTIVE INDEX, at 20 C	1.3877
OCTANE NUMBER	0.5 max.

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PHILLIPS PETROLEUM COMPANY

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meters north of the Jusepin field, drilling at 3,435 ft.; QX-1, 20 kilometers north of the town of Maturin, coring at 5,935 ft.; Socony AX-1, 20 kilometers northwest of the Santa Barbara field, drilling at 4,664 ft.; Consolidada (Sinclair) 1 Travieso and 2 Travieso immediately west of the Jusepin field. Consolidada SB-124, located 1 kilometer east of the village of Santa Barbara, has been abandoned.

Central Venezuela (Guarico).—The state of Guarico in central Venezuela is rapidly gaining importance as a potential oil producing area following the success of the S. A. Petrolera Las Mercedes Co. (Texas Co. and Caracas Petroleum Co.) in the Las Mercedes area. Atlantic and Creole have moved into the area and are progressing on wildcat operations.

Atlantic has staked a wildcat location 10 kilometers north of the town of Tucipido, for 1 Tucipido.

Creole is aggressively testing its Barbacoas concession. Two wildcats are now drilling there, XB-1 at 2,489 ft. is located 15 kilometers southeast of the town of Barbacoas. Creole XB-2, 20 kilometers south of Barbacoas, is coring at 2,675 ft.

Thirty kilometers southeast of the Creole tests, the Caracas Petroleum Co. and The Texas Co. have completed 1 Grico. No definite information is available concerning this well, but it is rumored that production of some kind has been found. If true an important extension of the Las Mercedes trend has been found since the well is about 30 kilometers west of the Mercedes field. Grico 1 was completed February 27 at a total depth of 5,027 ft.

Mercedes Co. 2 Camazas is drilling at 4,496 ft.

Barinas area.—In southwestern Venezuela, Socony-Vacuum's wildcat operations are being watched closely, since a discovery in that area would open an extensive region for development which has been generally neglected by most of the companies because of scarcity of geological information and the inaccessibility of the area.

Silvestre 1, down 10,153 ft., will be abandoned shortly. The well is 30 kilometers southeast of the town of Barinas. Yaure 1, located 16 kilometers southwest of the town of Santa Barbara, is currently drilling at 5,849 ft.

Socony-Vacuum has drilled one other dry hole in the Barinas area, the 1 San Vicente, located in the southern part of the state, which was dry at 7,082 ft. At least three and possibly more wells are scheduled for 1946 in addition to the current operations.

Western Venezuela. — The Lake Maracaibo area continues to be the focal point of concentrated wildcat operations with four wells reported in the immediate area of the lake itself. One wildcat is also drilling in the area west of the lake and one to the east in the state of Falcon.

Venezuelan Oil Concessions (Shell) is drilling three wells in the immediate Lake Maracaibo area. Ballenato (BA) 2, about 25 kilometers east of the Lagunillas field, is at 6,883 ft.; 2-A Curacoa, 20 kilometers east of Cabimas, is drilling at 8,630 ft.; VL-1, a deep test being drilled by Creole for Shell and located in the lake itself west of Tia Juana, is down 5,560 ft.

Orinoco Oil Co. (Pure) is drilling 2 Calentura, 50 kilometers northwest of the town of Maracaibo. The well is drilling at 10,290 ft.

Richmond Exploration Co. abandoned 1 La Montañita March 1 as a nonproducer. The well was located 32 kilometers north of the town of Pedregal, state of Falcon. Richmond 1-1 Zulia, approximately 25 kilometers southwest of Maracaibo, is drilling at 7,863 ft.

Venezuelan wildcats. — By companies with well number, location and status:

Creole Petroleum Corp.

QX 1, Monagas, 18 kilometers north 10 degrees east from Maturin, drilling.

JX 2, Monagas, 14 kilometers north of the Jusepin field, drilling.

XB 1, Guarico, 19 kilometers north 87 degrees 15 minutes east of the town of El Sombrero, drilling.

XB 2, Guarico, 15 kilometers south 55 degrees east of El Sombrero, drilling.

Venezuelan Oil Concessions, Ltd.

Ballenato (BA) 2, Zulia, 27.5 kilometers east of the town of Lagunillas, drilling.

Curacao 2-A, Zulia, 14 kilometers east of the town of La Rosa, drilling.

VL 1, Zulia, 20 kilometers south and 11 kilometers west of La Rosa, drilling.

Mene Grande Oil Co.

BG 60, Monagas, 15.1 km. north 86 degrees west of the town of Santa Barbara, temporarily suspended.

Caico 1 (CaM 1), Anzoategui, 34 km. south 27 degrees 30 minutes west of the town of Cantaura, discovery.

Caico 2 (CaG 1), Anzoategui, 770 meters south 9 degrees 15 minutes west of the discovery well, Caico 1, drilling.

GM 4, Anzoategui, west of the West Guara field, 8.3 km. north 49 degrees west of the San Tomé pipe line terminal, discovery.

La Ceiba (CG) 1, Anzoategui, 33.7 km. south 75 degrees 40 minutes east of the town of San Mateo, testing.

Nipa 1 (NG 1), Anzoategui, 33.7 km. south 40 degrees east of the town of Cantaura, discovery.

Nipa 2 (NG 2), Anzoategui, 9.45 km. due east of the discovery well, Nipa 1, drilling.

Tácata 1 (TaG 1), Anzoategui, 35.8 km. west of the town of Santa Barbara, abandoned.

Tácata 2 (TaG 1), Anzoategui, 8.5 km. north 72 degrees 15 minutes west of Tácata 1, drilling.

Socony-Vacuum Oil Co., C. A.

Nipa 1 (NV 1), Anzoategui, 2.3 km. south 88 degrees west of Mene Grande's Nipa 1, discovery, drilling.

SGV 39, Anzoategui, 444 meters south 48 degrees east of Mene Grande's GM 4, discovery, drilling.

Tascabaña 1, Anzoategui, 15 km. northwest of the Oficina field, gas producer.

AX 1, Monagas, 21 km. north 22 degrees west of Santa Barbara village, drilling.

Silvestre 1, Barinas, 29.5 km. south and 42 degrees east of the town of Barinas, abandoning.

Yaure 1, Barinas, 15.7 km. south 23 degrees 33 minutes west of Santa Barbara, drilling.

Compañía Consolidada de Petróleo (Sinclair)

Travieso (T) 1, Monagas, 3 km. south and 40 km. west of the town of Maturin, unreported.

Travieso (T) 2, Monagas, 3 km. south and 39.4 km. west of Maturin, drilling.

SB 124, Monagas, 1 km. east of the town of Santa Barbara, abandoned.

S. A. Petrolera Las Mercedes

Grico 1, Guarico, 10 km. north 30 degrees west of the town of El Punzón, possible discovery.

Camazas 2, Aragua, 40.5 km. 58 degrees east of the town of Barbacoas, drilling.

Venezuelan Atlantic Refining Co.

San Pedro 1, Monagas, 14 km. south and 12 km. west of Maturin, drilling.

El Hueso 1, Monagas, 15 km. south and 28 km. west of Maturin, drilling.

Tonoro 1, Monagas, 22 km. south and 68 km. west of Maturin, drilling.

Tacat 1, Monagas, 25 km. north 96 degrees west of the town of Santa Barbara, drilling.

Tucipido, Guarico, 7 km. north 30 degrees east of town of Tucipido, location.

Richmond Exploration Co. (Standard Oil Co. of California)

La Montañita, Falcon, 32.5 km. north 10 degrees east of town of Pedregal, abandoned.

Zulia 1-1, Zulia, approximately 10 km. west and 25 km. south of town of Maracaibo, drilling.

Phillips Venezuelan Oil Co.

FT 1, Monagas, approximately 13.5 km. north 96 degrees west of town of Santa Barbara, drilling.

Orinoco Oil Co. (Pure)

Calentura 2, Zulia, 22 km. north and 43 km. west of Maracaibo, drilling.

Barnsdall Oil Co.

Manquito 1, Guarico, 11 km. west of the town of Pariaguan, drilling.

Russia Claims Reserves Are World's Greatest

MOSCOW. — A claim that Russia has the world's largest oil reserves has been made in the government's newspaper Izvestia by Nikolai Baibakov, Soviet oil commissar.

Thirty-four new oil sources were discovered during the war, against 83 in the previous 20 years, he said. One large oil area developed during the war is located east of the Volga. Other new production is being found in Daghestan in central Asia and in Sakhalin, he added.

Lahee Named Chairman of A.P.I. Reserves Committee

NEW YORK.—Dr. Frederic H. Lahee, chief geologist for Sun Oil Co. in Dallas, will become chairman of the American Petroleum Institute's committee on reserves succeeding J. Edgar Pew, Sun Oil Co., Philadelphia.

F. H. LAHEE

In announcing Pew's resignation, William R. Boyd, Jr., A. P. I. president, pointed to "the great contribution to the oil industry's reserve picture" made by Pew as chairman of the committee since its inception in the autumn of 1936.

Dr. Lahee has been a member of the committee since it was organized and was the unanimous choice of the group for the chairmanship. He graduated from Harvard University in 1907 and received his Ph. D. in 1911. After serving on the faculty at Harvard and later at Massachusetts Institute of Technology, Lahee joined Sun Oil in 1918, becoming its chief geologist in 1920. He was editor for several years of the Bulletin of the American Association of Petroleum Geologists and served as president of the organization.

McCarthy Gets $22,000,000 Loan for Oil Development

HOUSTON. — Glenn H. McCarthy, Inc., is to receive a loan of $22,000,000 from the Equitable Life Assurance Society of the United States, to be used in development of oil properties in Texas. This loan was received by McCarthy Oil & Gas Corp., of which McCarthy is president. It is believed to be the largest single loan in history to Texas oil interests. McCarthy said that his companies expect to spend $33,000,000 in oil development enterprises in Texas during the next 5 years.

This most recent loan will be spent entirely in Texas oil development, the company president said. His operations include gas plants, gas production and pipe lines, natural gasoline and cycle plants, ranging through 10 Texas counties of Liberty, Jefferson, Chambers, Duvall, Brazoria, Caldwell, Gonzales, Wharton, San Jacinto and Hardin. McCarthy shares the wildcat interests in Gonzales County with H. R. Cullen, another Houston independent oil operator; Gonzales has no production at present.

McCarthy made no specific statements regarding individual projects but did indicate that some of them will be similar to the large $9,000,000 gas collecting and cycling system and natural-gasoline-recovery plant placed in operation recently at Winnie, Jefferson County. This activity has nothing to do with the McCarthy Center project in Houston, to cost $18,000,000.

Straight and Ambrose Get New Cities Service Posts

BARTLESVILLE, Okla. — H. R. Straight, who has headed Cities Service Oil Co. (Del.) and Empire Pipeline Co. since their organization, has been made chairman of the board of the two companies, and A. W. Ambrose, executive vice president of the companies, has been moved into the presidency.

Straight's election as board chairman culminates an oil industry career which began with his father who was a Pennsylvania operator. He became manager of the Henry L. Doherty oil properties in 1912 after Doherty acquired the T. N. Barnsdall interests with which Straight had been associated.

H. R. STRAIGHT

A. W. AMBROSE

Ambrose, a 56-year-old native of California, has been associated with Cities Service the last 23 years in various executive positions. After holding various positions in the production, land, and geological departments, he became vice president and assistant general manager in 1930. He was made executive vice president in 1941. Ambrose also served 8 years as vice president of Cities Service Gas Co.

Technical Topics Feature Dallas N.G.A.A. Meeting

DALLAS.—Discussions of technical problems will occupy most of the attention of members of the Natural Gas Association of America during their 3-day silver anniversary convention opening here April 17.

Cycling operations will be a major subject the opening day. T. S. Bacon, Lone Star Producing Co., will present a paper on high pressure well corrosion. The annual Hanlon award for individual meritorious service will be presented the morning of April 18. That afternoon, the outlook for gasoline and cycling industries will be discussed by J. H. Dunn, Amarillo, association president. The convention will end April 19 with panel discussions on operating trends in the industry.

DEATHS

Frank A. Stoneback, 71, who retired 12 years ago as manager of the export trade department of Socony-Vacuum Oil Co. in New York, died March 30 in East Orange, N. J.

B. E. Owen, 67, field inspector for the Kilgore office of the Texas Railroad Commission, died March 31 in Kilgore.

Arthur Smith Dwight, 82, widely known mining engineer who was a past president of the American Institute of Mining and Metallurgical Engineers, died April 1 in Hobe Sound, Fla.

Herman E. Marsh, 47, head of the land department of Amerada Petroleum Corp., died April 3 in Tulsa.

W. H. Francis, 61, retired vice president and general counsel for Magnolia Petroleum Co., died April 3 in Dallas.

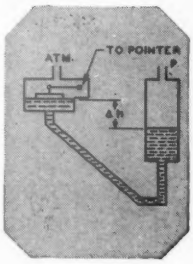
Robert Cheney Hart, for many years an operator in Venezuelan oil fields where he was president of United Venezuelan Oil Co., Ltd., died recently in London. A former British consul in Cuidad Bolivar, Hart also was interested in other properties throughout Venezuela. He was a pioneer in Mexican oil development and prior to World War 2 drilled several wells in North Texas.

John W. Williams, 75, who retired 11 years ago as a vice president of Gulf Refining Co., died April 3 in Pittsburgh.

Frank M. Selby, 89, early-day operator in the Mid-Continent field who organized Selby Oil & Gas Co. after the opening of the Glenn pool in 1906, died April 6 in Marietta, Ohio.

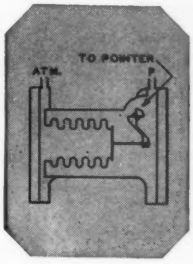
Arthur R. Campbell, 67, executive vice president of the Louisiana-Arkansas division, Mid-Continent Oil and Gas Association, died April 7 in Shreveport. Campbell, a native of Canada, settled in Shreveport in 1920 and first engaged in the lease-brokerage business. Later he went into the producing and drilling business as A. R. Campbell & Co. He became executive vice president of the association's Louisiana-Arkansas division in 1935 after several years as a consulting engineer in New York and Shreveport.

do under Pressure...



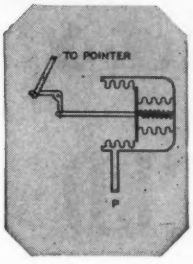
U-tube manometer

Mercury U-tube with float on surface. Cast iron or steel. Range limits: 0-10 to 0-200" water.



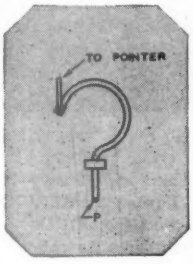
aneroid manometer

Steel body with bellows of bronze or 18-8 alloy. Torque tube, no stuffing box. Ranges: 0-20 to 0-500" water; 0-20 to 0-100 psi.



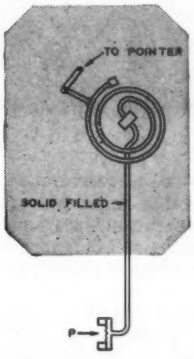
bellows

Sealed bellows, no stuffing box. Bellows and housing bronze. Ranges: 0-3 to 0-25 psi.



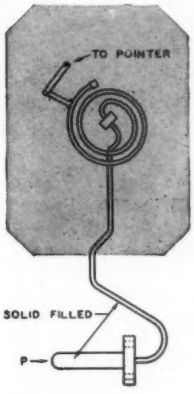
C spring*

Variation of multi-coiled bourdon spring. Entirely steel. Ranges: 0-2001 to 0-10,000 psi.



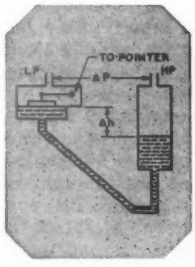
diaphragm*

Self-contained. For measuring sludges, etc. Diaphragm of any material. Maximum length of tubing 50 ft. Ranges: 0-15 to 0-500 psi.



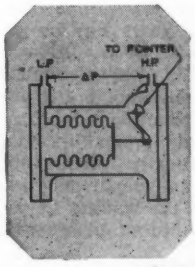
volumetric pressure for liquids*

Steel (silver plated for sanitary services). Compression of bulb actuates spring. Temperature compensation permits tubing up to 35 ft. Range: 0-5000 psi.



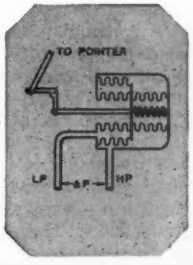
U-tube manometer

Mercury U-tube with float on surface. Cast iron or steel. Ranges: 0-10 to 0-200" water.



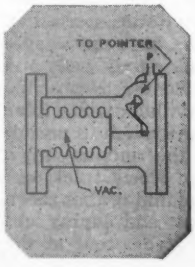
aneroid manometer

Steel body with bellows of bronze or 18-8 alloy. Torque tube, no stuffing box. Ranges: 0-20 to 0-200" water (0-500" on order).



bellows

Sealed bellows, no stuffing box. Bellows and housing bronze. Ranges: 0-5 to 0-25 psi.



aneroid manometer

Steel body with bellows of bronze; torque tube of stainless steel; no stuffing box. Ranges: 0 to 20 to 0-500" water absolute, or equivalent units of measurement.

Taylor Instruments

MEAN

ACCURACY FIRST

IN HOME AND INDUSTRY

OPERATIONS IN WORLD'S HIGHEST FIELD

by Neil Williams

One of the Morrison sand wells showing the simplified flowing hookup. Sundance wells are pumping. At the left is the road leading down the canyon out of the field. At the right is a section of the new 6-in. pipe line which was being laid out of the field

EIGHT years old in February, the Wilson Creek field in Rio Blanco and Moffat counties, northwestern Colorado, now has a total of 26 producing wells with two additional tests in process of completion. Eleven wells are producing from the Morrison sand, embracing an area of approximately 2,300 acres to date; 15 wells are in the Sundance sand with a productive area of approximately 1,500 acres. One of the two wells being completed will be an additional Sundance producer. The other, potentially productive in either sand, was drilled as an exploratory test to deeper horizons. At 12,702 ft., in the Devonian formation, where drilling was suspended, it set a new depth record for the Rocky Mountain region. In the meantime it has been plugged back and tested oil showings encountered in drilling through the Pennsylvanian Weber sandstone below 8,200 ft. These showings were found to be noncommercial and the well will be completed as a gas-injection well in the Morrison formation. Only one dry hole has been drilled.

Considering the extremely mountainous terrain in which the field is located, its comparative isolation and the attendant difficulties in providing access to and preparing drilling sites, and other associated operating problems, this development represents an unusual engineering achievement. In addition, the field has several other claims to distinction, such as being the highest field in the country, and with one exception (a newly discovered field in China) the highest in the world. It is an excellent example of unitized, orderly operation, without which development of the field probably would not have been economically feasible.

Operated by The Texas Co., the field is owned jointly on a unit plan by this company and The California Co. The discovery well, Unit 1, located on what is now the east side of the field, was completed February 11, 1938. No additional wells were brought in that year. Since then, the completion rate by years has been: 1939—1 well; 1940—2 wells; 1941—3 wells; 1942—4 wells; 1943—2 wells; 1944 and 1945—6 wells each, and 1946—1 well. Present production is approximately 6,000 bbl. daily, making the field second to Rangely (about 50 miles west) in size and importance in the state, and one of the leading fields in the entire Rocky Mountain area.

Road System

Location of the field is 45 miles southwest of Craig, Colo., the nearest city and railroad point, and about 12 miles off the paved highway extending from Craig to Rifle, Colo. An all-weather road, much of it built and maintained by the operators, leads from the paved highway into the field. The last 10 miles of this road is up winding Wilson Creek canyon with a rise in elevation of about 1,100 ft. in that distance. Through the field system, this road connects with a road to Meeker, 19 miles southwest of the field. During the early development of the field, one of the first in northwest Colorado, the closest supply stores were about 200 miles distant but last year stores were established at Craig.

Surface elevation of the field ranges from about 7,200 ft. to more than 8,400 ft. above sea level. Elevation of the lowest and highest wells so far drilled are 7,594 and 8,378 ft., respectively. Contours, typical of the mountainous terrain, are highly irregular, and marked by precipitous slopes, peaks, and canyons. In one case there is a difference of 321 ft. in the elevation between two adjacent wells (Nos. 14 and 26) spaced 1,320 ft. apart.

Under these circumstances, road construction within the field has been a major phase of the operations. The road system now totals more than 35 miles in length, forming a systematic network linking all wells and parts of the field. So far as possible all roads into individual wells have been looped into the system to permit operators to make the rounds with a minimum amount of "back tracking." A great deal of planning has been necessary in routing and laying out roads to minimize grades and at the

same time eliminate unnecessary mileage.

The roads had to be cut from the face of the mountains, and of necessity had to follow circuitous and zig-zag routes around and up the sides. They are characterized by numerous hairpin turns and at places by precipitous drops off the sides. One particular stretch follows such a winding and zig-zag course down the side of a mountain that it has been designated as the "Little Burma Road." It has been possible to use bulldozers for cutting all except about 10 per cent of the roads. On the latter, blasting has been required. Grades, except in a few places, have been cut to a maximum of 8 per cent. The few exceptions do not exceed 10 per cent. The greatest difficulty so far encountered in cutting grades has been to prevent overshooting or undershooting the desired points of intersection with existing roads.

Normally, road building is limited to about 5 months out of the year since heavy snows can be expected as early as October and as late as the middle of May. Snow sometimes reaches a depth of 8 ft. on the level, and usually remains on the ground throughout the season. Roads are kept open with snowplows, and although travel sometimes may become difficult and treacherous because of packed snow or ice it never is entirely stopped except possibly for short periods immediately after deep snows. Consequently, it has been possible to carry on operations the year around.

***Above:** Portion of the field camp with the field office and warehouse visible at the mouth of the canyon in the distance. Another row of houses (not visible) is located at the foot of the mountain below the brush in the foreground. **Right:** The Texas Co. and California Co.'s Unit 20, Wilson Creek field, drilled to 12,702 ft. as the Rocky Mountain district's deepest test. Failing to find commercial production in the lower formations, it has been plugged back to the Morrison sand, one of the two producing horizons of the field, for a gas injection well*

Drilling sites, like roads, usually must be cut out of sides of mountains, and involve movement of considerable earth and rock. As in the case of roads, bulldozers generally are adequate for this purpose. Preparation of a drilling site costs on the average approximately $5,000. Any location upon which drilling is to be started during the winter months must be anticipated and the site prepared during the previous summer or early autumn.

Structurally, the field is a typical Rocky Mountain anticlinal fold, somewhat domal in shape but slightly elongated. It extends approximately 7 miles in a northwesterly-southeasterly direction and is about 5 miles wide at its widest point. Both producing horizons are above sea level and overlie the top of the structure more or less uniformly. The Morrison sand, the shallower zone, however, is continental while the Sundance is of marine deposition. Both are Jurassic in age, and are believed to have a com-

mon source bed, a black shale section in the interval between them.

Original development was in the Morrison horizon. The pay level in this formation is found at a structural elevation varying from 1,375 to 1,525 ft., and at depths of 6,375 to 6,675 ft., depending on surface elevation and position on structure of the respective wells. The Morrison formation is about 475 to 500 ft. thick with oil saturation occurring in a sand zone about 350 ft. below the top. This zone varies in thickness from 20 to 100 ft. (average about 80 ft.), of which from 20 to 40 ft. usually is commercially productive. So far no water has been encountered in the Morrison sand, leaving the downstructure limits of production in this zone undetermined, except for one dry hole on the northeast edge drilled early in the development. Further development of this sand upstructure over the top of the structure also has been left pending drilling up of the Sundance sand, in which development has been concentrated since the 11 Morrison wells were drilled.

The Sundance sand lies approximately 200 ft. on the average below the top of the Morrison pay zone at a structural elevation of from +1,390 to +1,180 ft (water level +1,260 ft.) and at depths from the surface of from 6,600 to 6,900 ft. The section is approximately 400 ft. thick, in which there is upwards of 80 ft. of almost unbroken saturation. Wells completed in this sand are bottomed about 20 ft. above the water level to insure an adequate margin of safety from water advancement. All present Morrison wells, except Unit 2 including the discovery well, originally were drilled to this sand. Located at structural positions where they found the sand below or near the water, they then were plugged back and completed in the Morrison zone.

Production Methods

Gravity of the oil produced from both horizons is about 51° A.P.I., and otherwise the two crudes have the same general characteristics, which bears out the belief they have a common source bed. Producing conditions differ slightly. Morrison wells flow naturally, and are being produced at a rate of 200 to 300 bbl. daily each with gas-oil ratios averaging around 360 cu. ft. per barrel. Reservoir pressure runs 1,850 to 2,180 psi. Porosity of the sand is about 20 per cent, while permeability, although variable, is in the order of about 100 millidarcys. Sundance wells are completed on the pump although pumping in most instances serves more for agitation of the wells than for actual lifting of the oil. In this, pumping attains an efficiency of more than 130 per cent. Most of the wells are capable of flowing for short periods after shutdowns. Sundance wells are being produced at rates of 200 to 350 bbl. per day. Gas-oil ratios average about 110 cu. ft. per barrel, while reservoir pressure is around 2,200 psi. The sand is coarser grained than the Morrison and on the whole is somewhat more permeable. Porosity varies from 16 to 24 per cent. It has a horizontal permeability of about 390 millidarcys. Vertical permeability varies from zero to about 87 millidarcys.

Pumping is done with individual units operating as a rule at the rate of sixteen 54-in. strokes per minute with 2¼-in. plunger pumps. At present the units are being powered with 12-hp. single-cylinder gas engines. However, the field is being electrified and the gas engines will be replaced with electric motors. These will be 9-14-25 hp. triple-rated units to handle variable load requirements. Power will be supplied from a central field plant now under construction, and which at the start will consist of two 175-kw. generators. The plant is designed so that additional units can be installed later.

Field gas, which until now has supplied fuel for pumping power, is to be returned to the producing formation in a pressure-maintenance project to be undertaken as soon as installation of a compressor plant, now under construction, is completed. The plant at the start will have two 225-hp. compressor units having a capacity of approximately 1,000,000 cu. ft. of gas daily.

So far as drilling is concerned, no particular problems unusual to Rocky Mountain operations have been encountered. As in many fields of the district, there are fissured or broken shale zones in which loss of mud circulation is a hazard. These may occur almost anywhere through the large shale which extends almost from the surface down to a depth of around 5,300 ft. In most instances, however, the trouble can be prevented or cured without too much difficulty or delay by regular addition of cotton-seed hulls or other filler material to mud system, and by holding mud weight at a minimum. There are no pressures which would demand a weight of more than 9.8 lb. per gallon, the maximum allowed, and generally while drilling the shale section, the weight is held under 9.5 lb.

Mud control is exacting but not especially difficult to maintain. Because of the presence of bentonitic streaks in the shale, the mud must be kept conditioned for low water loss and thin filter cake. Water loss usually is held around 6 to 8 cc. Any addition of water to reduce weight is made slowly with adequate premixing. Close watch is kept of mud volume in the system to note any tendency toward loss of circulation into the formations. Steel mud tanks are used exclusively to facilitate accurate observance of any loss. Viscosity is maintained around 45 seconds for the greater part of the hole. Control calls for the use of commercial mud and chemical treatment.

Surface hole is drilled with 9-in. bit and then reamed to 13⅜-in. diameter for 10¾-in. casing. This string is set and cemented at a depth of from

Laying 6-in. pipe line out of field showing coating and wrapping machine moving along supported pipe

400 to 600 ft. to place it through the lowest coal zone, which is found at a depth of from 300 to 500 ft. Nine-inch hole is drilled under the surface casing to bottom through the producing sand, where 7-in. casing is run and cemented for the oil string. For completion casing is perforated with four 9/16-in. shots per foot at levels determined mainly from electric logs made prior to setting the oil string. The number of holes ranges from 70 to 324, averaging 240, for Sundance wells, and 74 to 355, averaging 145, for Morrison wells.

Average time is around 75 days with the shortest time so far being 56 days and the longest 100 days. Fairly good time, as much as 600 ft. per day, usually can be made through the upper shale section down to the Frontier sand around 5,300 ft. Through the latter sand and the Dakota sand to around 6,000 ft., the time will run less than 5 ft. per hour, and from there to bottom from 2 to 4 ft. per hour, sometimes less. Approximately 50 bits are required.

The Rocky Mountain region's deepest test is Unit 20 located near the top of the structure in the center of the field. Its total depth of 12,702 ft. is 760 ft. greater than that of the next deepest test (Superior Oil Co. 1 Miller, Divide Creek structure, Mesa County, Colorado). Drilling began August 14, 1944, and reached total depth late in December 1945. Instead of the usual 10¾-in. casing, 13⅜-in. pipe was run for the surface string. This was cemented with seat at 603 ft. Nine-inch hole was drilled through the Sundance sand to 7,247 ft., and then reamed to 12¼-in. for 9⅝-in. casing, the longest string of this size ever run in the Rocky Mountain area. Below this string, 8⅝-in. hole was drilled to bottom, a total of 5,229 ft. of open hole. Bits below the surface casing included forty-five 9-in. bits, twenty-four 12¼-in. bits (reaming 9-in. hole), and approximately 200 8⅝-in. bits. Should commercial production not be established in the Pennsylvanian Weber sandstone now being tested, the well can be completed either in the Sundance or Morrison sand.

All wells have been drilled under contract by Noble Drilling Co. Mechanical rigs, directly powered by three 225-hp. gas-fueled engines, and having two 7¼ by 18-in. mud pumps have been used. Drilling has been done with 122-ft. steel derricks on 8-ft. substructures except the deep test, for which a 136-ft. derrick with 30-ft. base was substituted to provide more pipe and working space.

Water for general field use is obtained from a number of shallow canyon-bottom wells at the north entrance to the field. From these wells, located at an elevation of 7,070 ft., the water is boosted through a 3-in. line, a distance of 22,030 ft., to a central 5,000-bbl. supply tank set at an elevation of 8,190 ft., 1,120 ft. above the pump station. From this point it has been possible to gravity water to all except a few locations in the field. Because of the severe cold during winter months, all water lines are buried to a depth of 5 ft. Wells are operated with turbine pumps and the water boosted to the central supply tank by a 4 by 10-in. reciprocating pump driven by an 80-hp. diesel engine.

Gathering System and Outlet

Production until now has been handled through a single central gathering station, at which there are seven 500-bbl. and eight 1,000-bbl. stock tanks and three separators, one for testing purposes and two for regular production. This is located in the main canyon leading out of the field at the north end and at a place where the elevation is approximately 7,700 ft. The main gathering system at present totals approximately 65,000 ft. of 4 and 3-in. lines. The lines are routed circuitously around rises in elevation to take advantage so far as possible of downgrades, and except for a few wells on the south and opposite side of the elevation divide across the field all production can flow by gravity to the tank battery. A second central battery now is being built at a low point on the south side of the field to serve wells on that side and avoid having to lift their production over the divide.

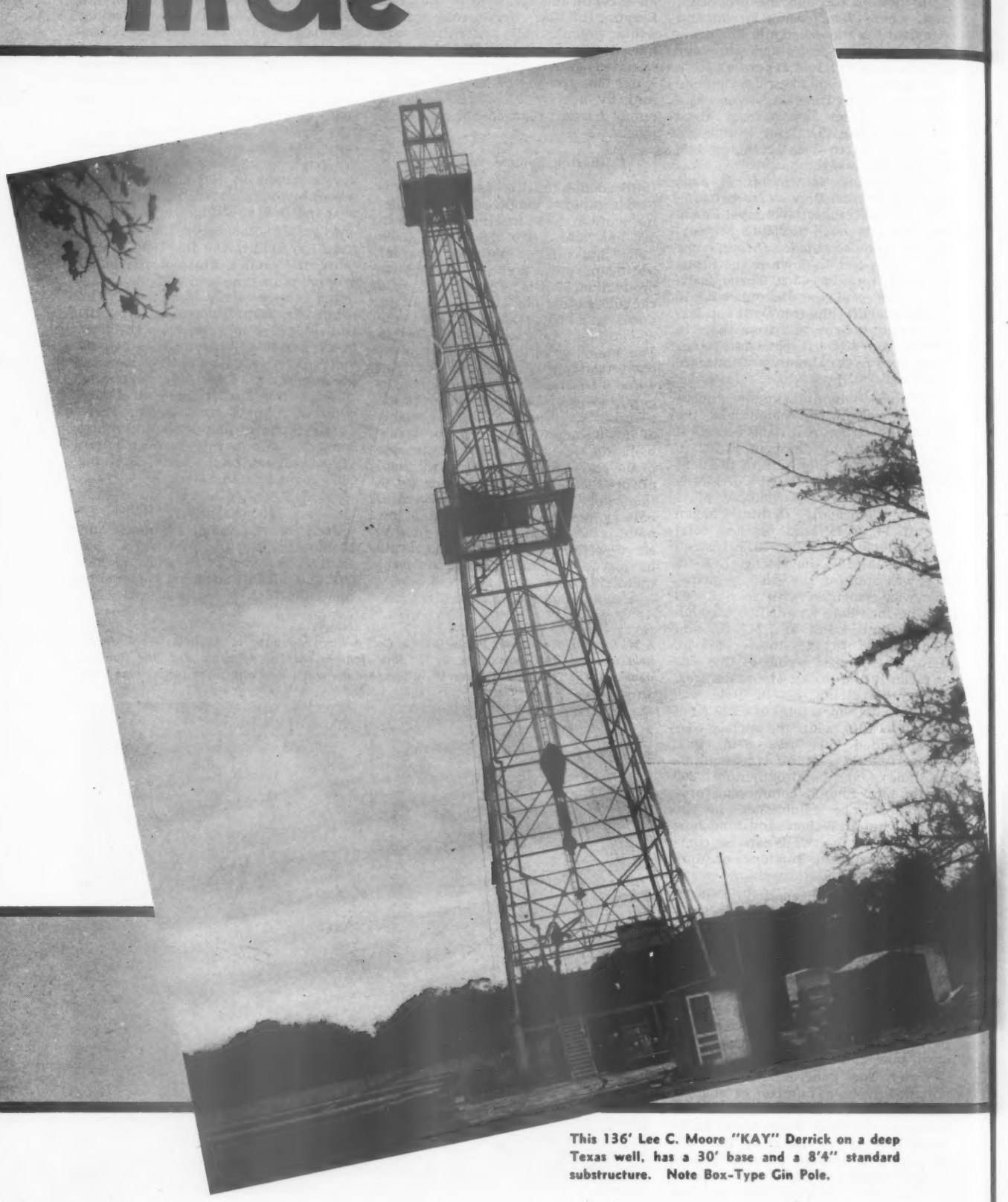
A camp, including a field office and warehouse, modern, well-kept individual houses for employes, and a grade school, is maintained in the field. The school and company houses have had to be located in a single row on the mountain side along the street leading up a narrow canyon into the field. Because of limited space for expansion at this place, a second camp is now under construction in another part of the field. In addition to the electric light, gas, water, and sewer systems serving the camp, telephone lines cross the field to which connections are made to drilling rigs and other key locations in the field. A high-school bus is operated regularly from near the field to Craig.

A gravity-flow pipe line extends from the field to the Iles field, a distance of 15 miles. This consists of an original 4-in. line and a 6-in. paralleling loop recently completed. The line has a fall of approximately 1,100 ft. in the first 10 miles from the field to the mouth of Wilson Creek canyon which it follows. At Iles, the line connects with a 6-in. line extending through the Moffat field to Craig, where it supplies crude to The Texas Co.'s refinery at that point, and it also connects with a line to Wamsutter, Wyo., junction on Utah Oil Refining Co.'s main line to Salt Lake City.

Jack M. Campbell, Albuquerque, N. M., attorney, has been chosen executive secretary of the New Mexico Oil and Gas Association succeeding the late Hugh L. Sawyers.

J. M. Duncan, toolpusher, Noble Drilling Co., drilling contractor in the field; W. K. Neish, field foreman, The Texas Co.; O. J. "Slim" Johnson, drilling foreman, and Roy Robbins, geologist, The Texas Co., Casper, Wyo. Temperature was below zero when picture was taken

Moore "KAY" TYPE



This 136' Lee C. Moore "KAY" Derrick on a deep Texas well, has a 30' base and a 8'4" standard substructure. Note Box-Type Gin Pole.

Low-Cost Cleaning Tool Has Many Useful Applications

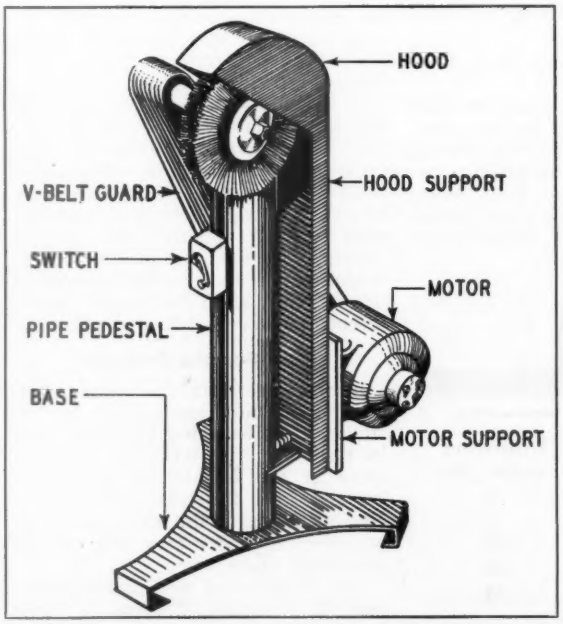
BUILT at a low cost, the tool shown in the drawing has proven to be useful for removing rust and scale from reclaimed bolts, pipe fittings, and similar items. Over-all construction of the tool is rugged but it is not suitable for operating grinding wheels for general machine-shop work. The tool, however, is suitable for operating a 12-in. or smaller wire-wheel brush for general buffing service.

A triangular section of ¼-in. plate, about 3 ft. long, is cut into the shape shown in the drawing to form the base. Three 2 by 1½-in. pieces of structural angle 3 in. long, which serve as feet, are welded to the plate with the 1½-in. leg pointing toward the center of the base. The pedestal which is welded, on center, to the base is made of a 42-in. length of 4-in. pipe and has a 5-in. piece of 4 by 4 by ⅜-in. angle centered and welded to its upper end. Two 11/16-in. holes are drilled on the 4-in. angle's gage line on 2½-in. centers or about 1¼-in. in from each of its ends. These holes should be accurately located in a horizontal position because the bolts that pass through them fasten the bearing housing to the pedestal. If the bolt holes are not located in a plane parallel to the base plate feet the tool may have a tendency to creep when operated.

Ordinary single-row ball bearings are housed in a section of 3-in. shafting which has been bored for the shaft and counterbored to accommodate the bearings. Bearings which are about 2¼-in. o.d. and ⅞-in. i.d. will give good service under ordinary usage; if larger-size bearings are desired the diameter of the housing should be proportionately increased. The cover plates for the housing which also serve as bearing retainers are attached to the housing with four ¼-in. capscrews each.

To obtain good contact between the ball-bearing housing and the 4-in. angle to which it is attached, both parts should be machined along their contact surfaces. In order to avoid point contact of the circular housing it should be machined to a depth of about ⅛ in. parallel to its long axis and midway between the end plate bolt holes in its ends. Width of the flat surface obtained by this machining operation will be about ¼ in. for a 3-in. diameter circle. The tapped holes for mounting the housing to its support may be drilled through the housing wall to intersect with the bored hole for the shaft if desired to avoid using a bottom hole tap for running the ⅝-in. threads for the mounting screws.

Some type of dust seal should be built into the cover plate so that dust may be kept away from the bearings and shaft where it passes through the plate. The spindle end of the shaft is machined to standard arbor dimensions of the size selected. Other machine work on the shaft includes turning shoulders and diameters for the bearings and machining the pulley end for a standard V-belt keyed and set screwed pulley. Light-gage sheet is used to make the hood which is supported from the motor base by a channeled section formed from the same material that is used to fabricate the hood. The channel-shaped hood support forms a duct or guard that reduces the scattering of dust when using the tool for buffing. For the motor base a rectangular piece of plate is welded to the pedestal as near to the floor as practicable.



BOOKS

BIBLIOGRAPHY ON THE PETROLEUM INDUSTRY. By E. DeGolyer and Harold Vance, Texas Engineering Experiment Station (at Texas A. & M. College), College Station, Tex. 730 pp. Paper bound $2.00. Cloth bound $3.00.

This bibliography was made possible by combining Dr. E. DeGolyer's personal bibliography containing some 12,000 items with the bibliography of the petroleum engineering department at The A. & M. College of Texas plus a complete bibliography on the air-gas lift furnished by S. F. Shaw. The references have been arranged under some 900 different subjects, using the decimal system of indexing of Prof. L. C. Uren, of University of California. A table of contents gives the 10 major subdivisions of this bibliography and an alphabetical subject index is located at the end. All of the references under each subject have been arranged in chronological order starting with the oldest reference.

TECHNICAL BULLETIN NO. T-22. Effect of Chloride on Physical Appearance and Chemical Composition of Leaves on Pecans and Other Native Oklahoma Trees. By Horace J. Harper. Published by Oklahoma A. and M. College Agricultural Experiment Station, Stillwater, Okla. 30 pp.

Here is a study in which the legal departments of many companies should be interested since it provides an accurate method of detecting any damage to trees from the accumulative effect of overflow water carrying chloride from oil-field brines which escapes or seeps into natural drainage channels. Several areas of bottom land in East Central Oklahoma were studied over a 5-year period to determine if some less laborious method than soil sampling could be used to detect injury to trees caused by chloride deposited in the soil from overflow waters. The chloride content of tree leaves collected in late August or early September will show whether the soil contains enough chloride to interfere with normal growth, the study shows.

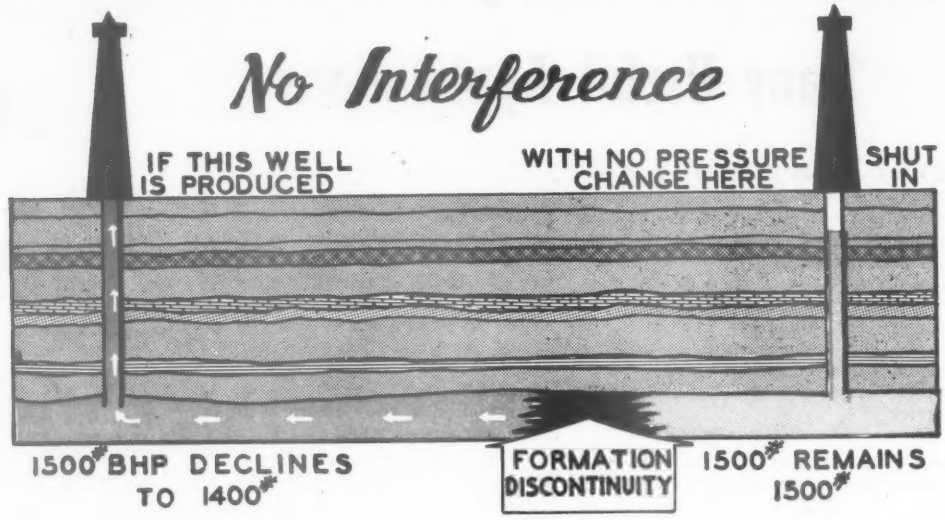
STEEL IN THE WAR. Written and compiled by Douglas A. Fisher, of Office of Assistant to Chairman, United States Steel Corp., 71 Broadway, New York. 164 pp.

The war role of a basic industry and its largest producer is revealed in this book. Assembled for the first time are facts and figures which measure the importance to the national security of this basic metal. The book, which is handsomely illustrated, is divided into 12 chapters, and a statistical summary. It is being made available to thousands of libraries where it may be used as an industrial reference volume.

THE SURVEY OF CANADIAN OILS. 1946 edition prepared by The Financial Post, Toronto. $1.

This volume gives information on over 500 companies—details on property holdings, production, earnings, dividends and financial position of established companies. It also provides data on defunct, dormant, and inactive companies, bringing to some 2,400 the total of all companies covered. Information on oil royalty distributions is also provided. A feature of the new volume is the enlarged map section reflecting the search for oil in many new fields. Existing fields have been remapped.

A PRACTICAL TEST ON SPACING AND DRAINAGE



by ***Kenneth B. Barnes***

Well-Interference Studies Are Important in

WELL interference is the effect that the operation of one or more wells has upon the status of adjacent wells. There are numerous instances where well-interference effects have been noted in different fields, and many cases have been described in private reports. Extremely little, however, has been published in the way of actual figures and results. In this article and three others to follow will be presented summaries of a considerable number of well-interference tests that recently have been taken, with the aim of bringing forth more prominently the nature of these interesting determinations, how they are made, and their use.

Effects of Interference

One form of well interference is the diversion of the flow of fluids to certain wells. This is caused by producing other wells in the same formation, and accordingly, altering the previously established pressure gradients in the reservoir. The diversion of the flow rate will include both the magnitude of the change in rate and changes in the direction of flow. To present a simple illustration of this kind, a single well in a field may be producing at its capacity of 1,000 bbl. per day. An offset is completed and produced at capacity. The first well drops to a rate of 754 bbl. per day. The second well thus sets up an "interference effect" on the first well. This is an alteration or interference of a previously established flow condition in the reservoir.

Another form of interference is where the producing of a well or wells alters the closed-in bottom-hole pressure of other wells in the pool. In this case, the interference affects previously established closed-in pressure conditions. In the field, since pressures are much more easily measured than rates of flow, interference tests generally involve producing certain wells and observing the drawdown in the bottom-hole pressures of the closed-in wells.

Besides the interference in rate of flow and effect on pressures of closed-in producing wells, interference effects also can be present between injection wells.[1,2,3] In commencing water-drive operations in semidepleted fields, the injection to individual wells initially will be independent or unrelated in effect to the injection to other input wells. Later, however, the input to adjacent wells will attain such quantities that the water fronts from the wells interfere with each other. From this point on, the injection pressure-rate characteristics of the wells change to a new course. The same kind of interference also occurs between injection wells in gas-repressuring and cycling operations. In injection wells, however, interference effects usually are studied through the medium of electrolytic models rather than by the drawdown of pressures, as in the case of interference between producing wells.

Rate of flow, bbl. per hour	B.hp., psi.	Drop from static, psi.	B.hp., psi.	Drop from static, psi.
None	1,326	0	1,326	0
8.9	1,312	14	1,322	4
41.2	1,260	66	1,307	19
59.7	1,230	96	1,298	28
77.5	1,202	124	1,290	36

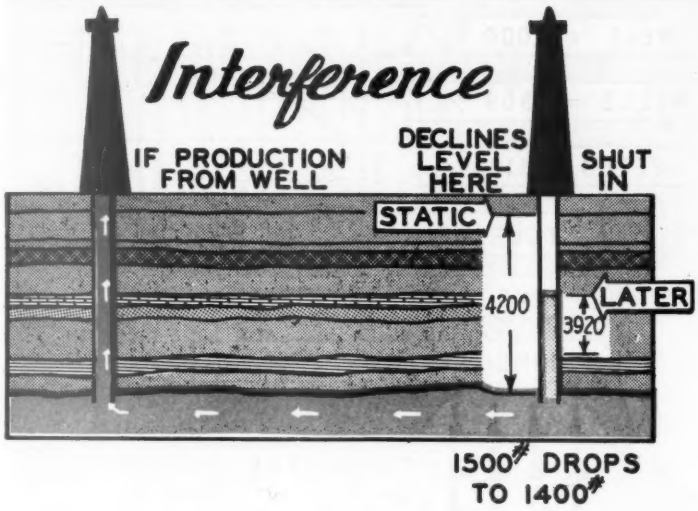
Fig. 1—Interference tests by U. S. Bureau of Mines.[5] Viola limestone, 4,140 ft., central Kansas

Well-Spacing Problem

Interference tests likely have their most important application to the study of well-spacing problems, and in particular, in throwing light on some of the formational characteristics, specific producing field by specific producing field, that cannot be answered by laboratory experiments or theory alone.

And what is the well-spacing problem? Most simply, it either is "close spacing" or "wide spacing," but more

IS TO USE THE WELLS THEMSELVES



Spacing, Drainage Problems

accurately it is the matter of obtaining the proper or optimum spacing that satisfies all pertinent aspects. To many that have had work or interests in the matter, the problem is still in a state of flux, with many answers still unsettled and additional data wanted. Perhaps well-interference tests will help. To trace the spacing problem, briefly, up to its present status:

For many years the accepted standard spacing was one well to 10 acres. For about the past 10 years a great many pools have been developed on 40-acre spacing—and virtually altogether so during the war period 1942-45. The present majority practice of 40-acre spacing, however, currently is under review in many areas, and for several reasons. One is that war restrictions are now off and those that wish to drill closer may do so. In the other direction, deeper pools are being found, with physical and economic conditions such that some operators desire to space wells further apart than 1 to 40.

Taken from either side, however, well spacing has three major considerations: (1) The economic aspect, (2) the "pure science" of the fundamentals of fluid flow and recovery, involving idealized reservoirs and conditions, and (3) the homogeneity and continuity of the producing strata. Well-interference tests seem most applicable to answering various questions of the third division, or as to "homogeneity and continuity." Before looking at interference-test procedures and results, however, two of the many fundamental relations that have been brought out by research, and that lie in division (2) above, should be presented for attention. One deals with radial flow, the other is a striking example of well interference under idealized conditions.

When there is one well in the center of a radial flow system that is of uniform thickness and permeability, and with one fluid flowing, Muskat[4] has shown the following relations to apply:

(a) Pressure at any point in the reservoir varies with the logarithm of the distance outwards from the center of the well.

(b) Velocity or production rate varies directly as the net drop in pressure to the well, and inversely with distance outward from the well.

Remembering (a) above—which in effect states that, in production, the major portion of the drop in reservoir pressure occurs within a short distance of the well bore, and that the drop becomes smaller with increase in distance—is important in studying well-interference tests. Many interference results do not seem to follow this relation, not, of course, because there is anything wrong with the expression, but rather because the tests reflect reservoir conditions, possibly involving some linear flow, that are different from the ideal radial-flow case.

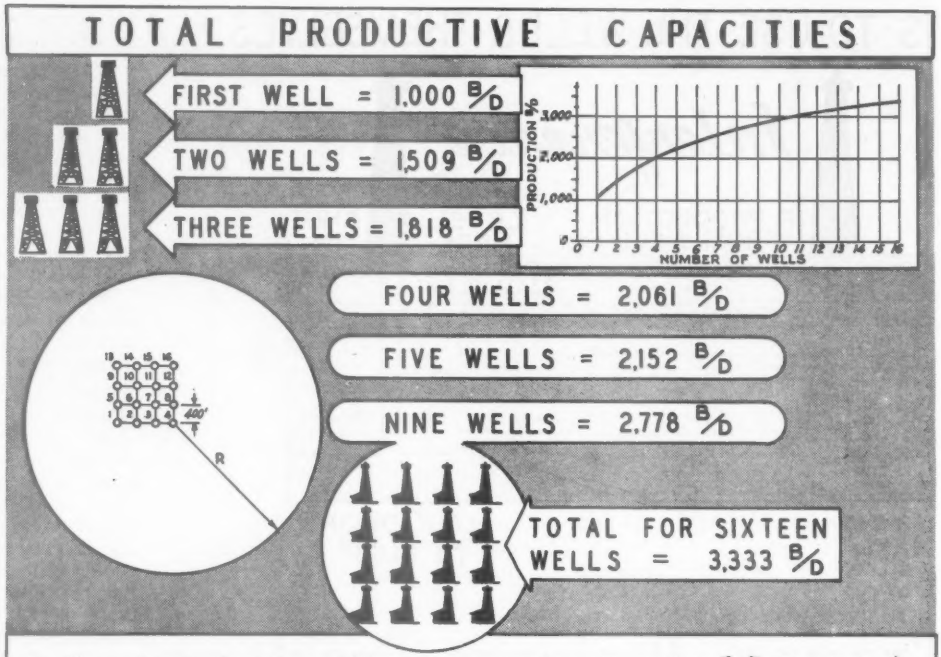
On interference itself, Muskat[4] has presented interesting and striking illustrations of the interference effects found in multiple well systems. One

TABLE 1—RESULTS OF INTERFERENCE TESTS IN THREE WESTERN KANSAS POOLS. PRODUCING FORMATION—ARBUCKLE LIMESTONE*

Central well			Offsets and nearby wells			
Rate of production (bbl./hr.)	Drop in fluid level (ft.)	Drop in pressure (psi.)	Well No.	Distance from central well (ft.)	Drop in fluid level (ft.)	Drop in pressure (psi.)
25	127	56	1	1,320	16	7
			2	1,320	18	8
			3	1,320	30	13
			4	1,320	38	17
	(Well No. 9)		5	1,867	15	6.6
			6	1,867	31	14
			7	1,867	0	0
			8	1,867	0	0
18	400	176	10	660	64	28
			11	660	107	47
			12	940	39	17
			13	1,020	4	1.8
	(Well No. 18)		14	1,200	11	4.8
			15	1,320	0	0
			16	1,400	0	0
			17	1,460	19	8.4
10	15	6.6	19	660	5	2
			20	933	8	3.5
			21	990	9	4
			22	1,190	10	4
	(Well No. 27)		23	1,320	4	1.8
			24	1,320	9	4
			25	1,473	8	3.5
			26	1,473	8	3.5

*From Amstutz and Stephenson.[10]

is shown in the accompanying drawing. The ideal conditions of uniform thickness, permeability, circular reservoir with constant influx, complete well penetration, and single-phase flow apply. The productive capacity of the first well (6-in. bore) drilled in this ideal field is 1,000 bbl. per day. If a second well is drilled 400 ft. away, the combined productivity capacity is not 2,000 bbl. per day, as perhaps might be surmised on first glance, but only 1,509 bbl. per day—due to interference. For three wells so spaced, the total capacity is 1,818 bbl. per day. It is 2,061 for a total of four wells, 2,152 for five wells, and but 2,778 for nine wells. For 16 wells, the total productive capacity is not 16,000 bbl. per day, but only 3,333. With this example of the effect of interference and spacing on well performance, we may turn to how interference tests are made in the field, and examine some actual test results.


TOTAL PRODUCTIVE CAPACITIES
FIRST WELL = 1,000 B/D
TWO WELLS = 1,509 B/D
THREE WELLS = 1,818 B/D
PRODUCTION B/D
3,000
2,000
1,000
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
NUMBER OF WELLS
FOUR WELLS = 2,061 B/D
FIVE WELLS = 2,152 B/D
NINE WELLS = 2,778 B/D
400'
R
TOTAL FOR SIXTEEN WELLS = 3,333 B/D
In the above circular, uniform reservoir of radius "R", Muskat [4] has shown the interference effect of two to sixteen wells.

Test Procedure

Interference effects can be obtained by shutting in a field or large producing area and, after equilibrium is established or closely approached, producing one well. The effect on the bottom-hole pressure or fluid levels of the other wells is observed (see cut on title page). Or the reverse procedure can be followed, with all wells being produced except the one where the combined interference effects are to be noted. That well, of course, is shut in and pressure or fluid-level tests are made on it.

The first method gives pressure-decline data at different points over the productive area, that is, at the location of each of the shut-in wells where the observations are made. For general field investigative work, this method usually should be the most useful. In the other method, the withdrawals from the area are larger, and the cumulative effects are concentrated in the observations at the single well.

In the special and simplest case where one well is produced and pressure-drop observations are made at one shut-in well, the two methods become one and the same thing. Other nearby wells, of course, either should be shut in or operated uniformly during the test. Results of such a two-well test by the U. S. Bureau of Mines are shown in Fig. 1. Wells within 1,760 ft. of the flowing well (depth 4,137 ft.) were closed in.

The pressure-decline observations can be made by pressure bomb, or where gassy or foamy oil conditions do not exist, by Echometer, Depthograph, or other sonic methods.[6,7,8,9] Using the central - producing - well method, and obtaining the changes in the fluid level of the offsets by Echometer tests, Amstutz and Stephenson[10] report results (Table 1) on three groups of Arbuckle limestone wells in western Kansas. The Arbuckle lime pools in this area are always found "on structure," have strong water drive, and usually have very little gas in solution in the oil (depth range, 3,200-4,200 ft.). For the tests, the authors summarize: "Interference between wells is common in the Arbuckle reservoirs and is responsible for measurable effects upon the bottom-hole pressures. It is a function of distance, time, and volume production rates. Pronounced effects were observed over distances as great as 1,867 ft. between wells."

References

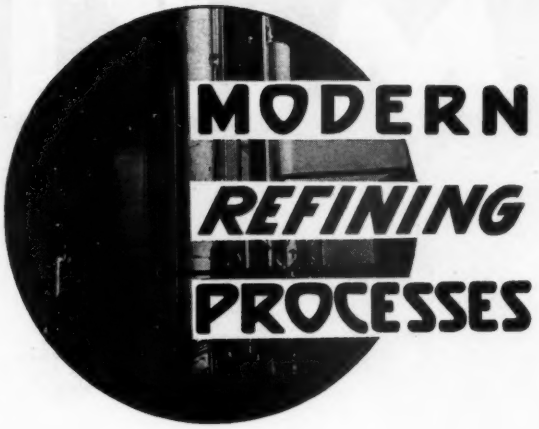
1. Yuster, S. T., and Calhoun, J. C., Jr., "Behavior of Water Injection Wells," Producers Monthly, Nov. 1944.
2. Dickey, P. A., and Andresen, K. H., "Behavior of Water Input Wells," The Oil and Gas Journal, Nov. 17, 1945.
3. Yuster, S. T., "Graphical Prediction of Water Flooding Intakes," Producers Monthly, Nov. 1945.
4. Muskat, M., "Flow of Homogeneous Fluids Through Porous Media," McGraw-Hill Book Co., Inc.
5. Eilerts, K., Smith, R., and Cook, A. B., "Properties of a Petroleum-Reservoir Liquid and Its Residua With Applications of the Data to Production Problems," U. S. Bureau of Mines R.I. 3474, pp. 43-47, Oct. 1939.
6. Walker, C. P., "Determination of Fluid Level in Oil Wells by the Pressure-Wave Echo Method," A.I.M.E., Vol. 123, p. 32 (1937).
7. Weber, George, "Fluid-Level Indicator Useful in East Texas," The Oil and Gas Journal, p. 44, Dec. 15, 1938.
8. Jakosky, J. J., "Bottom-Hole Measurements in Pumping Wells," A.I.M.E. Tech. Pub. 1058, p. 1, May 1939.
9. Rodd, Chas., "Determining Potentials by Drawdown Methods," The Oil and Gas Journal, p. 72, Apr. 3, 1941.
10. Amstutz, P. T., Jr., and Stephenson, E. A., "Optimum Producing Rates for Arbuckle Limestone Wells," Univ. Kans. Research Foundation Bull. 1, Chapter on Interference and Gravitational Displacement, pp. 50-66, Sept. 1944.

William E. Eberhart, Jr., vice president and treasurer, Climax Engineering Co., and five others have been elected by the Controllers Institute of America as members from the petroleum industry. The others are **William S. Hendry,** assistant treasurer, Gilbert & Barker Manufacturing Co.; **W. A. Tokola,** treasurer, Capital Co.; **John H. Bossert,** treasurer, Maguire Industries, Inc.; **J. W. Cason,** controller, Interstate Oil Pipe Line Co.; and **Martin A. McNulty,** controller, Standard Oil Co. of Indiana. The institute is a technical and professional organization devoted to the improvement of controllership procedure.

W. A. Thomas, Midland, Tex., has been named district geologist for Ohio Oil Co. in West Texas and New Mexico.

6. Use of Inhibitors In Motor Gasolines

by George Armistead, Jr.



THE use of inhibitors, or antioxidants, in motor gasoline has long been standard refinery practice. Studies of gasoline stability and the effect of various factors thereon made during the war have added measurably to the knowledge of oxidation phenomena in gasoline, particularly under the severe storage conditions encountered in tropical zones. Recent experience with the use of full-range catalytic-cracked gasolines as major constituents of motor-fuel blends has confirmed previous expectations as to the effect of these materials on stability. These findings have indicated more clearly the requirements for maximum stability of gasolines from the standpoint of oxidation and ethyl fluid decomposition. It is of interest to note the additions to knowledge on this subject and the present status of the use of antioxidants. In general, the conclusions from recent experience may be summarized as follows:

1. Motor gasoline containing cracked constituents requires inhibiting for maximum storage stability, regardless of prior treatment.
2. All leaded gasolines under severe storage conditions require inhibiting.
3. Catalytic-cracked gasoline which is now replacing some thermal-cracked gasoline in motor fuel is of better stability, and thus appreciable improvement in stability of over-all base gasoline may be expected.

The average refiner does not have to produce gasoline suitable for the long-time, high-temperature storage conditions which were of importance on military gasolines and it is indicated that for practical purposes there will be exceptions to conclusions 1 and 2 in the temperate zone, even under the most severe conditions normally encountered. The results of wartime tests and studies have, however, added to the knowledge of gasoline stability requirements which will be of value in establishing peacetime specifications and refining practice.

The complex chemistry involved in the auto-oxidation of gasolines is still not completely understood at the present time, particularly with regard to the criteria determining the performance of a gasoline in an engine or its behavior in storage. The deterioration of a gasoline in storage is mainly attributable to the oxidation of olefins with the resultant formation of gums detrimental to the use of the fuel in the engine, and in some cases, the breakdown of tetraethyl lead. The initial stage of such deterioration appears to be the formation of peroxides by the conjugate diolefins, which induce a type of chain oxidation reaction of the mono-olefins which ultimates in the formation of aldehydes, ketones, acids, gums, and other reaction products. Such oxidation is eventually accompanied by a darkening of color of the gasoline, and may involve the separation of the gum as a heavy oil, although in the initial stages color is not a positive index of gum or other oxidation products. Various gums derived from cracked gasoline were analyzed by Story, Provine, and Bennett[12] and showed compositions in the range of 65-72 per cent carbon, 7-8 per cent hydrogen and 19-26 per cent oxygen with molecular weights from 172 to 338. It is possible for oxidation to proceed to the point of affecting the octane rating of unleaded gasolines, apparently due to the presence of the oxidation products, although gumming properties in the engine would generally be prohibitive before such a point is reached.

EXPERIENCE with gasolines stored for long periods, at tropical temperatures, offers a basis for peacetime specifications and practices. General conclusions drawn from tests, which covered storage periods up to 18 months at severe temperature conditions, omit consideration of copper-dish gum and improvement in induction period resulting from inhibitor. Chemical treating of cracked gasolines tends to improve stability but if operation is not employed primarily for other reasons costs may prove uneconomical for elimination or reduction of diolefins alone, by this method. Catalytically cracked gasolines such as used in blending present-day motor fuels are reported to be responsible for the improvement in the stability of the base gasoline.

Causes of Gumming

The properties of gasoline most important to the refiner from the standpoint of gumming and its associated difficulties in the engine are: (1) The amount of actual or preformed gum, the nonvolatile oxidation product dissolved in the gasoline at any given time, and (2) the tendency of the gasoline to form gum under favorable oxidizing conditions. The actual or preformed gum is determined by the A.S.T.M. Method D-381-44, which comprises controlled evaporation in a glass dish.[3] This method is generally considered to be indicative of the gumming tendency of a gasoline in an engine at a given time.[1] The copper-dish gum and induction period have long been used as indications of the tendency of gasoline to oxidize,[6,7,8,9] but both tests are highly empirical and until recently no satisfactory correlations with storage stability had been made, although the two tests together have been very useful directional indications of stability. Both of these properties depend to a large extent on the origin of the gasoline, as straightrun gasoline has comparatively little oxidizing tendency whereas the cracked gasolines are liable to oxidation and gum formation somewhat in proportion to their olefin content, particularly those produced under severe conditions in which diolefins are formed to an appreciable extent. The employment of chemical treating such as sulfuric acid, or clay treating, serves to reduce or eliminate the diolefins and improve stability, but involves substantial operating costs and investment, and the

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former must usually be justified for some other reason such as sulfur removal.

Antioxidants

The addition of an antioxidant, or inhibitor, to a gasoline already containing preformed gum, of course, has no effect on the content of that oxidation product or the properties of the gasoline for immediate use. It is true also that if oxidation gets under way it is more difficult to arrest than it would have been to prevent starting in the raw unoxidized gasoline, and more inhibitor is required to accomplish it. The mechanism of the action of inhibitors is somewhat obscure, but it appears to be based mainly on the fact that inhibitors are readily oxidizable materials. The often-quoted theory of Moureau and Dufraisse[10] visualizes that the inhibitor is oxidized by any hydrocarbon peroxides that form, the hydrocarbon is reoxidized by molecular oxygen, and the two peroxides react to regenerate the pure hydrocarbon and the pure inhibitor with the release of molecular oxygen. Other workers regard this theory with some doubt and feel that the presence of the inhibitor acts in a somewhat more direct way to suppress or break the chain oxidation reaction, although not acting as the sole absorber of oxygen. Since the beginning of the use of inhibitors in gasoline it has been recognized that the phenols and certain aromatic amines had effective antioxidant properties. In fact, cracked gasolines contain varying quantities of certain phenols which serve as natural inhibitors of oxidation, one result of which is the marked decrease in resistance to oxidation of such gasolines after caustic washing which extracts such materials. Many compounds have been employed commercially as inhibitors, including those with various structural combinations of aromatic hydroxyl, amino, and alkyl groups, most of these being directed at the over-all inhibiting of oxidation. In addition, during the period when the marketing of water-white gasolines was of importance, other materials were sold for the purpose of stabilizing color, and were usually of the aliphatic amine type of compounds. It has also been necessary under some circumstances, particularly where gasoline had been sweetened by one of the copper chloride methods to provide a metal deactivator to eliminate the oxidation catalysis effect of any metal remaining in the gasoline. Of the many materials which have been employed commercially, a large number have been discontinued for various reasons, and others, for lack of merit did not reach wide commercial acceptance. Table 1 lists a number of the most important inhibitors in current use, along with certain of their properties.

In addition to the materials shown in Table 1, there are other inhibitors which are particularly adapted to aviation gasolines, and a tri-cresol inhibitor which is used to a limited extent in motor gasoline.

The content of preformed gum, as determined by the A.S.T.M. Method D-381-44 mentioned in the foregoing is considered generally to be a significant index of the deposits in the engine induction system, carburetor and screens, on valves and valve stems, and other effects characteristic of the nonvolatile oxidation products. The significance of preformed gum as an index of piston lacquering is under discussion at the present time. The A.S.T.M. specification has long been 7 mg./100 cc. maximum.

The wartime test work on ordnance vehicles carried out by the gasoline additives project of the Coordinating Research Council[4,5] covered two rather extensive series of tests on wheeled and track-laying vehicles in comparatively severe summer weather conditions for the United States. Gasolines of high lead content with various inhibitors and containing A.S.T.M. gum from 1.5 to 50 mg./100 cc. were used. Engines were dissembled at the end of 5,000 and 10,000 miles on the wheeled vehicles in the two tests respectively, and at the end of 100 road hours and 2,900 miles on the track-laying vehicles in the two tests respectively. Examination of the engines, along with the observed performance confirmed that an A.S.T.M. gum content under 7 mg./100 cc. was satisfactory for indefinite operation of the test vehicles and that they could operate for short periods (less than 5,000 miles) on gasoline having up to 50 mg./100 cc. It was also brought out from examination of the engines that certain low-solvency straight-run gasolines containing high concentrations (35 lb./1,000 bbl.) of the aminophenol inhibitors shown in Table 1 were prone to leave induction-system deposits likely to give operating troubles after prolonged use, although none were experienced in the tests. This is thought to be of little significance as to the behavior of these inhibitors in cracked gasoline, in which they are normally used. The para - phenylene - diamine and tri-alkyl - phenol inhibitors were satisfactory at such high concentrations. These tests tend to confirm the previously held opinion in the industry that the 7 mg./100 cc. A.S.T.M. specification for gasoline for immediate use is adequate. From the refiner's point of view, practically all motor gasoline leaving the refinery has been held far below this level without difficulty and his chief concern is that gasoline shall have sufficient stability to stay below it during the period between shipment and actual consumption in the engine.

TABLE 1—COMMERCIAL MOTOR GASOLINE INHIBITORS

Inhibitor—	Quantity used, lb./M bbl. Min.	Max.	Affected by caustic	Affected by water	Affected by exposure to air	Wt. % in solution as supplied	Corrosive to iron
Antioxidants							
n-Butylparaaminophenol	5	25	Yes	Slight	Yes	50	No
Isobutylparaaminophenol	5	25	Yes	Slight	Yes	50	No
Disecondary butylparaphenylenediamine	3	12	No	No	Yes	100	No
Wood tar distillate	25	150	Yes	Slight	No	100	Yes
Butylaminophenol, butylphenylenediamine	5	50	Yes	Slight	Yes	48	No
Metal Deactivator							
Disalycilpropylenediamine	1	5	No	No	No	75	No

Stability Tests

The gasoline additives project also carried out two gasoline-stability programs of high-temperature desert storage in cans and drums ranging up toward 110° F. for periods of 6 to 18 months, paralleled in some cases by laboratory storage under corresponding conditions. Gasolines meeting the government 80 all-purpose specification 2-103B of various origins, inhibitor kind and amount, and containing lead were used in the tests, the object being to establish the initial gasoline specifications which would assure a satisfactory fuel after storage for 6 months or longer under these severe conditions. The general conclusions drawn from the tests, as reported by Sabina indicated the following requirements for gasoline suitable for such storage, with a maximum A.S.T.M. gum of 7 mg. after 6 months.

1. A maximum A.S.T.M. gum of 4 mg./100 cc.

2. A minimum A.S.T.M. induction period of 480 minutes.

3. A minimum inhibitor concentration in leaded gasolines of 5 lb./1,000 bbl. to prevent lead precipitation.

4. The requirement of 1-3 lb./1,000 bbl. metal deactivator in addition to inhibitor in copper sweetened stock going into the gasoline.

5. The use of certain proven inhibitors.

It is of interest that these conclusions do not take into consideration the copper-dish gum or the improvement in induction period resulting from the inhibitor addition. The A.S.T.M. induction period is very high, as was necessary to meet the very severe conditions of the test, and is equivalent to approximately 580 minutes by the U.O.P. induction period test. The desert storage tests indicated this high order of induction period was necessary to meet the severe conditions imposed by ord-

(Continued on Page 103)

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(Continued from Page 99)

nance (7 mg. A.S.T.M. after 6 months). This single criterion was demonstrated to be a reliable index of stability without additional support by the copper-dish gum or indication of the amount of stability imparted by natural inhibitors for this particular low-end-point gasoline (329 maximum 90 per cent).

Since the end of the war, catalytically cracked gasolines, from the processes employing the silica-alumina catalysts, have become a major component of motor gasoline blends. While such gasoline varies in character depending upon feed stock, operating conditions, and other factors, it is of generally low unsaturation and of good inhibitor susceptibility. Since a considerable portion of the catalytic gasoline will replace thermally cracked gasoline previously manufactured, it seems safe to say that the result will be an appreciable improvement in the stability properties of the base gasoline as a whole. The extent of such improvement will depend to a large extent on the average operating conditions that are found most economical, the end point of the average gasoline, and the type of catalyst employed. Low temperatures, low end points, and the use of synthetic silica-alumina catalysts tend in the direction of improved stability.

The caustic washing of both catalytically and thermally cracked gasolines prior to inhibiting is considered to be of much importance.[11] It serves to remove hydrogen sulfide that may be present as well as to remove any naturally occurring phenols which might show a high initial induction period but impair stability in storage. It is desirable to do such caustic washing as quickly as possible after the condensation of the gasoline to prevent the formation of compounds with the hydrogen sulfide which would be detrimental to inhibitor susceptibility. Such caustic-washed gasoline is particularly susceptible to oxidation and it is always desirable to complete its processing and the addition of inhibitor as quickly as possible. The possibility of caustic carryover from the washing or other treating steps must also be provided against where the inhibitor used is subject to extraction or other effect by caustic, as shown in Table 1, and where caustic is likely to be present the inhibitor necessarily should be of proper type.

In the sweetening of gasoline by the doctor process, it is necessary to avoid an excess of sulfur which would remain in the gasoline either as elementary sulfur or as polysulfides and impair the inhibitor response and lead susceptibility. Since such excess sulfur may not be detectable by the copper-strip test, the butyl mercaptan test is recommended for control of the excess. Copper-sweetened gasoline under normal operation is free of copper and is very responsive to inhibitor. However, due to the possibilities of operating irregularities which might result in copper carryover, it is considered generally desirable to add minimum amount of metal deactivator to provide against adverse effects from this cause.

References

1. "Significance of Tests of Petroleum Products," published by A.S.T.M., 1937.
2. A.S.T.M. Standards for Petroleum Products and Lubricants, 1945 edition.
3. Universal Oil Products Co. Booklet No. 224 (revised June 1944).
4. J. R. Sabina, "Stable Gasoline for War and Peace," presented before the metropolitan section of S.A.E., New York City, Jan. 17, 1946.
5. M. L. Alspaugh, "Gasoline Gum Tolerance of Ordnance Equipment," presented before the annual meeting of the S.A.E., Detroit, Jan. 1946.
6. E. W. Zublin, "Gum Testing With the Oxygen Bomb," The Oil and Gas Journal, July 16, 1931, p. 26.
7. V. Voorhees and J. O. Eisinger, "Significance of Gum in Gasoline," The Oil and Gas Journal, Dec. 20, 1928, p. 152.
8. Laboratory Test Methods for Petroleum and Its Products, Universal Oil Products Co., Chicago, Method No. H-6-40.
9. Laboratory Test Methods for Petroleum and Its Products, Universal Oil Products Co., Chicago, Method No. H-11-43.
10. Charles Moureau and Charles Dufraisse, "Catalysis and Auto-Oxidation, Anti-Oxygenic and Pro-Oxygenic Activity," Chemical Reviews, July 1926, p. 113.
11. Service Dept. Bulletin, Universal Oil Products Co., issued Feb. 20, 1946.
12. L. G. Story, R. W. Provine and H. T. Bennett, Ind. and Eng. Chemistry, 21, 1079 (1928).

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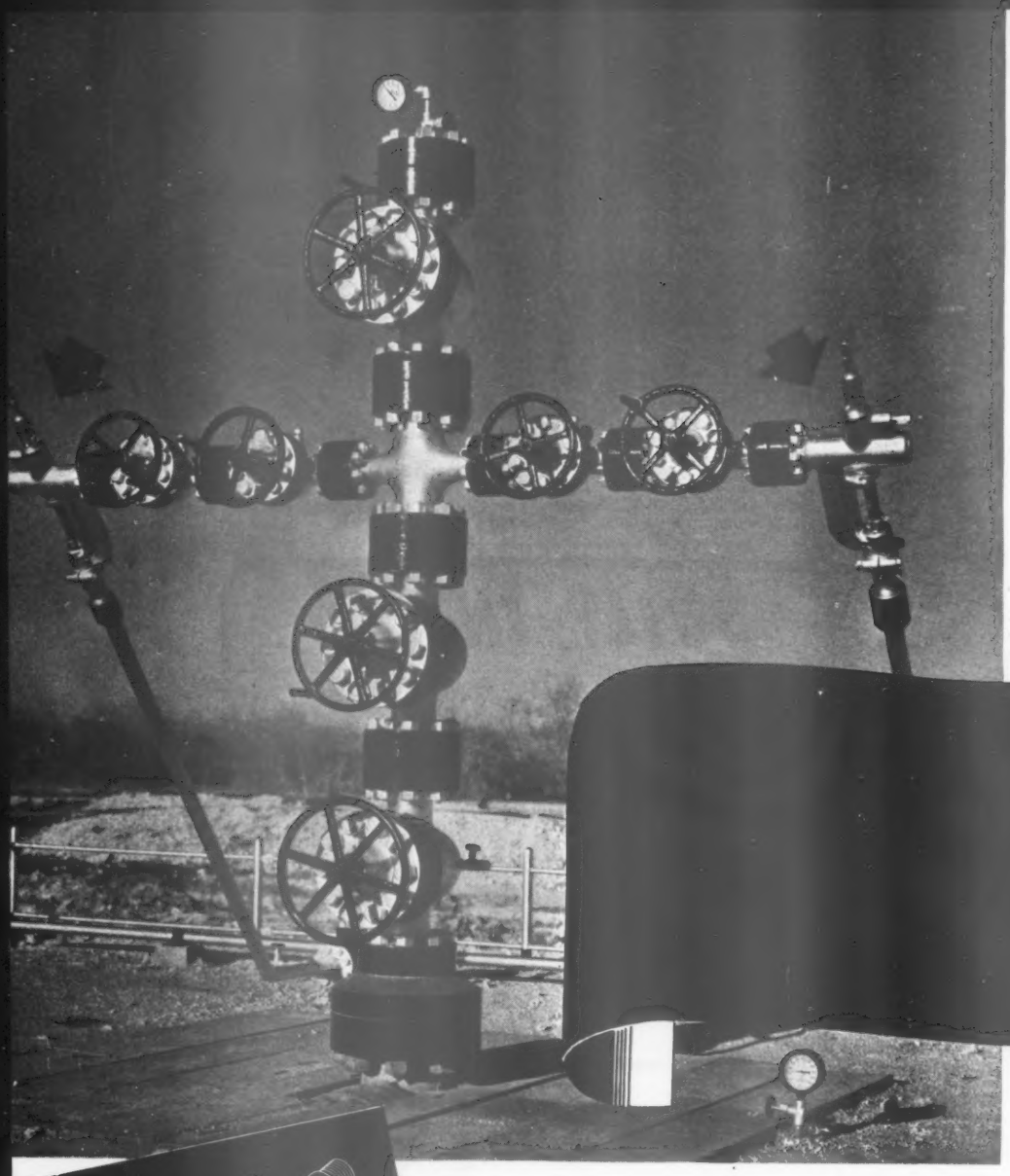

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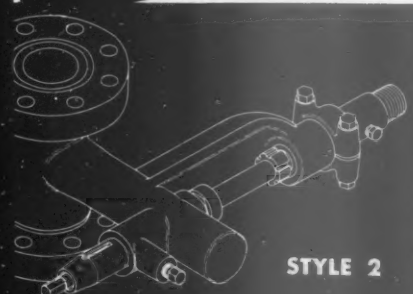
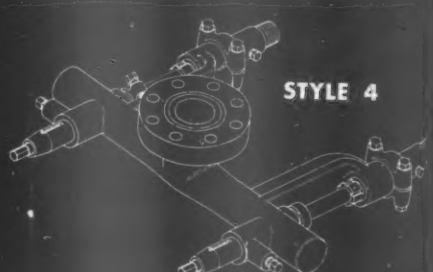


STYLE 2

Tee Type Flow Wing for installation in vertical run of Xmas tree.

STYLE 3

Cross Type Flow Manifold for installation in vertical run of Xmas tree.



STYLE 4

Tee Type Flow Manifold for installation in horizontal run of Xmas tree.

Do You Get 90 Per Cent SALT REMOVAL At 2 MILLS PER BARREL Chemical Cost? Ben Franklin Does—Here's How

by F. Duane Fuqua

WITH a flow control indicator to show the operator instantly how much water is being injected, crude is desalted by adding water at 130° F. and emulsifying crude and water at 210° F. The emulsion, treated with demulsifying chemical if necessary to break it, passes to a vertical settler where most of the water and salt are removed, thence to a horizontal settler to remove the last traces of salt solution, thence to the refinery proper. Salt remaining in the crude consists of only the smallest of the angular-plane crystals of NaCl, plus all of other type crystals. On the crudes studied settler temperature optimum is 200°-220° F., pressure drop across emulsifying valve should be 40-50 psi., water added should be 5-15 volume per cent of the crude charged.

IT is not the purpose of this article to set forth a cure-all salt-removal method as it is realized that the problems of crude-oil desalting are widespread.

The method described here utilizes well-known fundamentals of salt removal. The results are pleasing in that 90 per cent and better salt removal is constantly obtained with a chemical cost of less than 2 mills per barrel of crude processed.

Throughout the discussion the word "salt" refers to the chloride content, whatever the positive radical may be.

It is well known that salt is responsible for a great deal of refinery corrosion and deposition in topping, cracking, and exchanger tubes. Chlorides are particularly offensive since by hydrolysis they form hydrochloric acid which reacts with iron to form iron chloride. Hydrogen sulfide present in some oils reacts on the iron chloride forming iron sulfide and liberating hydrogen chloride which again attacks and the process is repeated.

Whenever salt-containing oils are evaporated, the salt is precipitated thus adhering to tube walls and progressively reducing the efficiency of heaters and exchangers both by decreasing heat-transfer coefficients as well as substantially increasing pressure drop.

Most salt-removal systems are similar in that they are integrated into essentially three main parts:

1. Introduction of water to the crude.
2. Emulsification of water and crude.
3. Demulsification of crude.

The greatest difference between salt-removal systems is in the method utilized in carrying out each step.

The process as utilized at Ben Franklin Refining Co. as shown by Fig. 1 involves introduction of a metered quantity of preheated water five pipe diameters from the suction of a reciprocating crude-oil charge pump. Water used is from the discharge of the cooling water circulating pump which takes suction from a hot well that receives the hot effluent from several condenser boxes. Makeup water to the hot well comes from a pond filled by surface water. The water has a relatively low hardness, but often contains a considerable amount of dissolved and suspended solids. The water circulating pump produces sufficient head to put the required amount of processing water through a brine to water exchanger and into the suction of the crude pump. However, should more pressure be desired, a small reciprocating pump has been provided.

An orifice has been installed on the water line and a flow-control indicator allows the operator to know at all times how much water is being injected. Valves allow the water line to be blocked from the crude and bypassed to a barrel to permit calibration of the meter at regular intervals as a safeguard against orifice fouling or mechanical trouble within the flow indicator.

Although the water from the hot well is 90°-100° F., the temperature of the water is raised to approximately 130° F. by heat exchange with the effluent brine which is drained to a spare tank until such time as it may be disposed of.

Demulsifying chemical, as re-

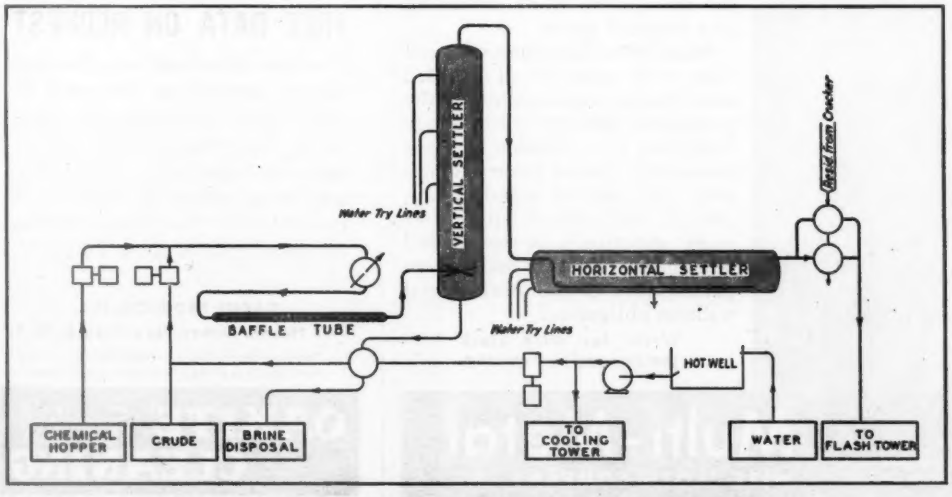
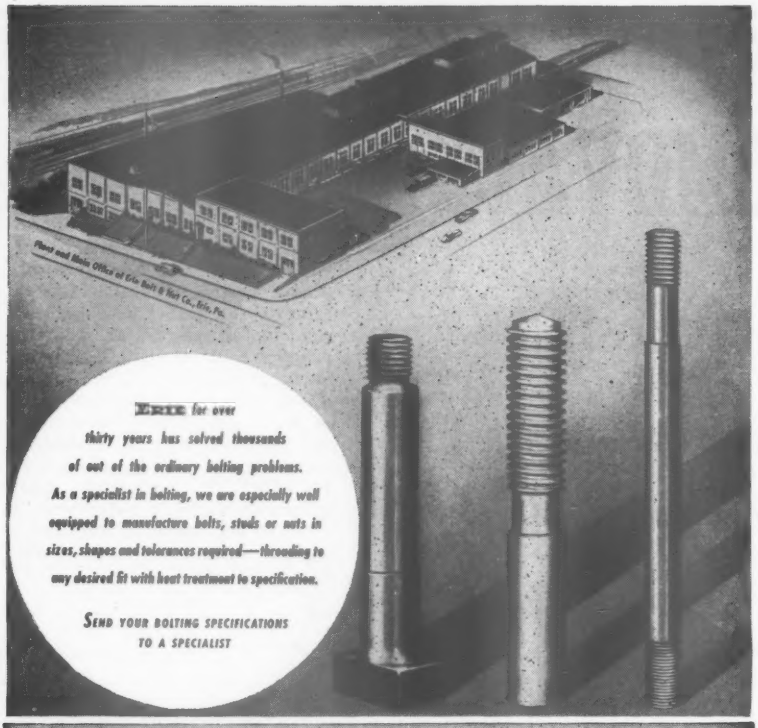


Fig. 1—Flow diagram of salt-removal equipment at Ben Franklin refinery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THE AUTHOR

F. Duane Fuqua was born in Iowa, and moved to Amarillo, Tex., in the middle of his high-school training. He graduated from high school and from Texas Technological College with degree of B.A. in chemistry in 1937, and spent 4 years as chemist and engineer with Phillips Petroleum Co. at Borger, Tex. During 2½ war years he was process engineer with Associated Refineries, Inc., at Duncan, Okla., transferring from there to process engineer with Ben Franklin Refining Co., Ardmore, Okla., his present position.

This article was presented at the annual meeting of the Western Petroleum Refiners' Association, Fort Worth, March 25-27.

quired, is pumped by means of an air-driven chemical-injection pump into the crude five pipe diameters downstream from the crude pump discharge. Chemical rates are easily adjusted by length of pump strokes, speed of pump, and number of cylinders operated. The quantity of chemical is obtained by direct gage from small hoppers. Operators are responsible for quantity of chemical used.

Water emulsion is formed by passing the crude and water mixture through an air-operated, double-port, throttle-type back-pressure-control valve. The valve, with Fisher Wizard controller, is set to hold a given back pressure on the crude pump, thus controlling the amount of pressure drop required for emulsion.

Next the emulsion passes through a topped crude to crude heat exchanger where sufficient heat is picked up to break the viscosity of the crude. Exchangers now being used for this service are thirteen 60-ft. lengths of 6-in. over 3-in. jacketed standard pipe connected in series. With 751 sq. ft. of external tube surface the mixture of crude and water is heated from 70° F. to approximately 210° F., while the 60-65 per cent yield of topped crude is cooled from 520° to 235° F. Crude is piped through the tube side and topped crude passes through the shell countercurrently.

Crude passes directly from the heat exchanger into a horizontal baffle tube. The baffle is fabricated of 80 ft. of 6-in. pipe with 25 slightly larger than semicircle segmental baffles welded into the pipe at regular intervals. Pressure-gage connections have been installed before and after the baffle, which may also be used for sample connections, or water or chemical insertion points (they have never been used as such during the course of this investigation).

From the outlet of the baffle tube, crude enters the bottom head of a 6-ft. by 35-ft. 8-in. vertical settler. The feed nozzle of the vertical ells up into the vertical and terminates in a cross-distribution header. The vertical vessel contains a perforated plate with 1-in. holes on 2-in. centers located directly below the top manway 6 ft. from the top of the vessel. The plate presently has no use, but at one time supported an excelsior packing which at the time proved to be worthless. Try cocks are located 20, 24½ and 29 ft. from the bottom of the vertical vessel. A water level of approximately 20 ft. is maintained in the vertical and crude is scrubbed countercurrently with water breaking from the emulsion.

Hot water is drawn from the vertical settler and exchanges heat with the fresh-water charge. The brine drawoff is hand controlled. Water-washed crude passes from the top of the vertical vessel into a 6-ft. by 35-ft. 8-in. horizontal settler where additional settling time is afforded. Actually the horizontal vessel is in the system only as a safety factor.

Crude enters the horizontal vessel through a perforated distribution header which runs longitudinally the full length of the vessel; the header was originally intended to provide additional water scrubbing through a water level held in the horizontal. Crude outlet is on top of the head opposite the feed entry. Try cocks are provided on the horizontal drum; also water may be drawn from the bottom of the vessel to the sewer.

A pressure gage on the outlet of the horizontal serves as an index for the back pressure that is held on the outlet of the farther exchanger.

Crude from the horizontal is split through two exchangers where heat is picked up from cracking-plant residuum. One exchanger is a Brown fintube exchanger piped series parallel 24 tubes—3 banks of 8 tubes, with 1,368 sq. ft. of external surface, exchanging heat with hot residuum (735°-520° F.) directly from the cracking plant. The other exchanger is identical in construction with the topped crude to crude exchanger, i.e., thirteen 60-ft. lengths of 6-in. over 3-in. jacketed pipe with crude on tube side and residuum effluent from the Brown exchanger on the shell side (520°-245° F.).

Under normal plant operation 375° F. crude preheat is obtained up to this point.

A 2-in. Fisher Wizard back-pressure control is located on the effluent of

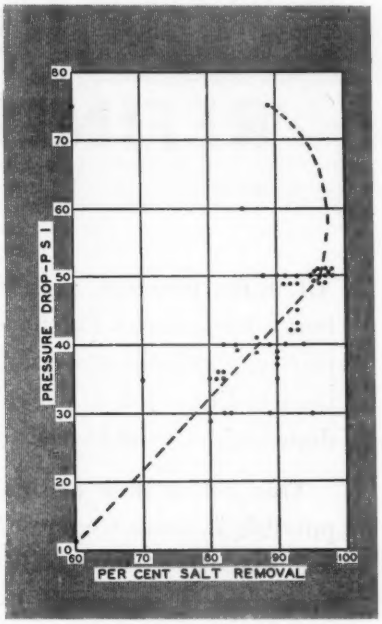

Fig. 3—(Above) ΔP versus per cent salt removal (other conditions varying)

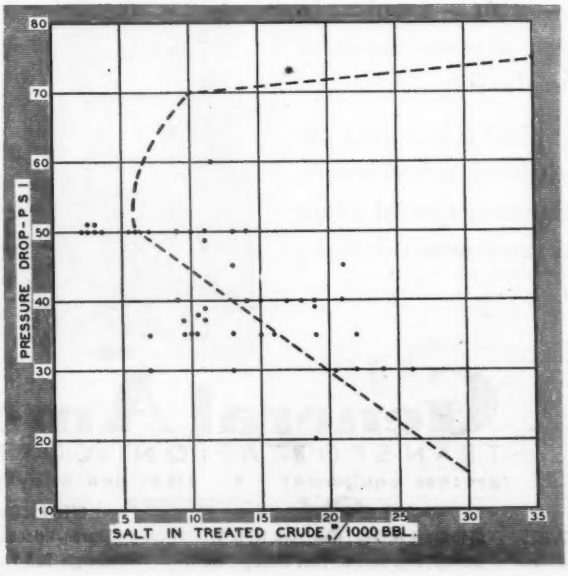

Fig. 2—(Left) ΔP versus salt in washed crude (other conditions varying)

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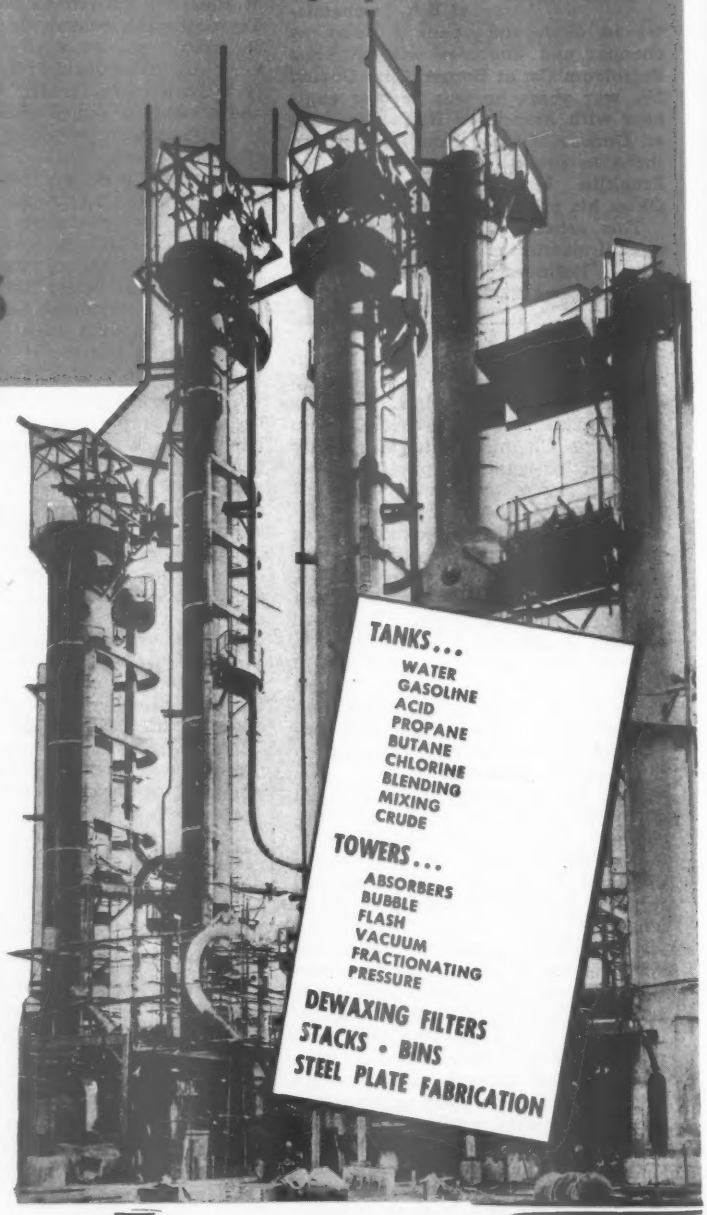

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the exchangers. Enough back pressure is held at this point to prevent vaporization within the exchangers and to maintain a back pressure on the horizontal settler of 125 to 140 lb.

Crude then passes to a flash tower where approximately 10 per cent of the crude is flashed to the fractionators and the tower bottoms are charged to the furnace.

In order to effect the greatest salt removal it is necessary that the salt be given every opportunity to contact water. Thus it was believed that water wash in addition to the original emulsification would be beneficial. However, any number of water washes is of no benefit if the film of the emulsifying agent is not broken, since this film encases dispersed droplets of brine.

The smaller the droplets the "tighter" the emulsion and the more difficult it is to break. So far as possible, the emulsion must be made to fit the crude; conversely the demulsification process must fit the emulsion.

If small droplets of water are to be coalesced it is necessary that the surface tension of their binding sheath be reduced to such point that the water droplets may break out by gravity.

Since surface tension is in direct relationship to viscosity, it is obvious that to effect good salt removal the viscosity of the crude must be lowered to such a point that droplets of water are no longer restrained by their binders. In the case of water and crude, if the viscosity is reduced by temperature, a greater difference in specific gravity will exist between the oil and brine, thus allowing a quicker and better separation.

If droplets of water can be made to contact each other thus forming larger droplets, gravitational separation is greatly accelerated. Turbulent flow is conducive for desired contact. Furthermore, the presence of baffles, grit, and chat make for more contact. Often, if emulsions are difficult to break, small quantities of demulsifying chemicals may be used.

Salt removal at Ben Franklin Refinery is subject to several variables, some of which are extremely important while others seem to be of little consequence. In every case, however, it is deemed advisable that all variables be watched, recorded, and correlated. It is important that the operators are educated to the variables and be kept abreast of all significant correlations.

Pressure Drop

Pressure drop is probably the most critical of all variables. A back-pressure control valve on the discharge of the crude charge pump allows a constant pressure drop to be maintained. Previous to the installation of the control valve, a gate valve on the discharge of the crude pump was kept in a throttled position to maintain the necessary back pressure. Various pressure drops have been tried on our composite crude ranging from 0 to 100 lb. With minimum pressure drop salt removal is poor, ranging from 60 to 80 per cent removal. Forty to fifty pounds differential across the emulsifying valve seems to be ideal for our crude. Pressure drop in the region of 75 to 100 lb. will often cause too tight an emulsion which, although often accompanied by excellent salt removal, is just as often subject to rather high water carryover (1 per cent and greater).

Once the optimum pressure drop is found, small variations do not seem critical as can be readily evidenced by the fact that the refinery uses a reciprocating charge pump rather than a centrifugal pump.

Pressure drop vs. salt content of final crude, with other conditions unchanged, showed a very good correlation in the region of 0-60 lb. pressure differential.

TABLE 1

Equipment—	Pressure (psig.)
Crude pump	210
Exchanger inlet	159
Baffle inlet	150
Baffle outlet	145
Vertical settler inlet	143
Horizontal settler outlet	140
Pressure outlet of residuum to crude exchangers	133

Pressure drop vs. salt content of final crude (Fig. 2) and pressure drop vs. per cent salt removal (Fig. 3) with other conditions varying, were correlatable.

Table 1 shows normal pressure measurements taken progressively through the salt-removal equipment.

The back pressure held on the system appears to be sufficiently high to prevent vaporization from occurring.

In order to get a feel of the pressures required, a small bomb was prepared and equipped with thermometer well and pressure gage connection. The bomb was charged with a composite crude containing approximately 10 per cent water in emulsion. The mixture was heated to 280° F. and pressures and temperatures were recorded as the sample cooled. At 270° F. the apparent vapor pressure of the sample was 50 lb. (Fig. 5).

Temperature and Viscosity

Temperature, as previously discussed, must be high enough to reduce the surface tension of the oil to the point that water will break out. Assuming that surface tension is a direct function of viscosities, temperature-viscosity curves of each of our crudes have been plotted and projected. (Fig. 4). It appears from these data that a viscosity, Saybolt Universal seconds, of approximately 40 seconds or less on our crudes must be reached to obtain optimum salt removal.

Previous to a recent heat-exchanger revamp, the temperature of the vertical settler was approximately 130° F. These conditions afforded salt removal only in the order of 50 to 80 per cent depending upon the type of crude charged and the amount of salt in the crude, i.e. with these conditions, the greater amount of salt in the crude charge, the better the per cent salt removal. Considerable amount of chemical was also used in an attempt to effect an emulsion break. The viscosity of our crude at 130° F. was 50 S.U.S. and above.

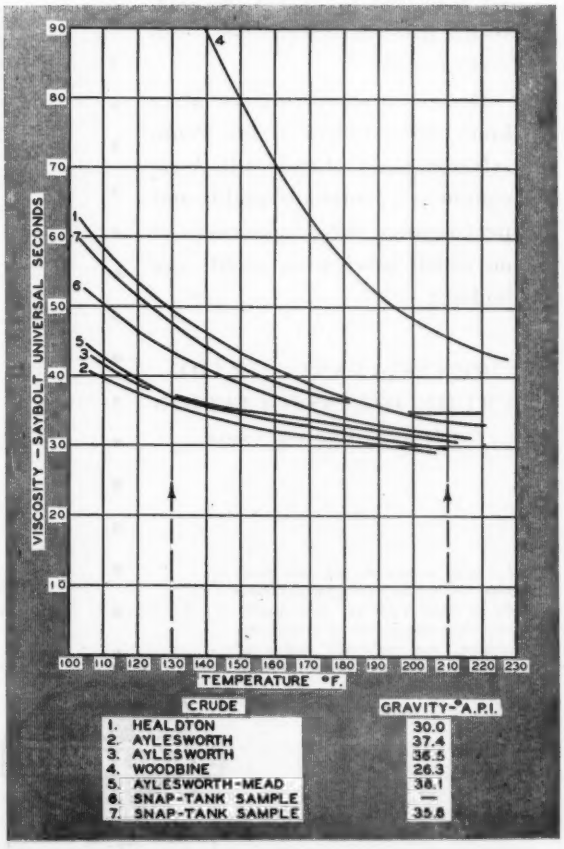

Fig. 4—Temperature versus viscosity curves of Ben Franklin crudes

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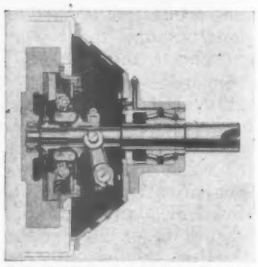

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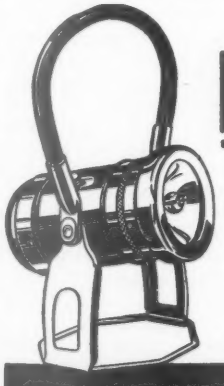

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Following the heat-exchanger revamp, the temperature of the vertical settler varies between 190° and 220° F. depending upon the quantity and temperature of topped crude exchanging heat with the crude.

At 220° F. and with an average crude charge, the S.U.S. viscosity is 34 seconds. With the aforementioned pressure drop of 40 to 50 lb., water flow at 5 to 15 liquid-volume per cent of crude charge, and S.U.S. viscosity of 34 seconds, 90-95 per cent salt removal may be obtained day in and day out without any chemical addition.

The importance of maintaining low viscosity has been illustrated by operating at the above conditions and suddenly changing the charge stock to a 26.3° A.P.I. gravity Woodbine crude, which with approximately the same temperature in the vertical settler increases the effective viscosity to 50 seconds S.U.S. The effect is as one would forecast, an increased water carryover and reduced salt removal. If, however, demulsifying chemical is added during the charging of the heavy crude, substantially good salt removal is still obtained. For this reason the refinery uses a small quantity of chemical as a safeguard against slugs of heavy crude or tank bottoms. It is planned to provide a system whereby segregated crude stocks cannot be charged directly to the stills, but must be blended with the composite crudes.

Temperatures required for the vertical settler should be in the range of 200° to 250° F. There seems to be no virtual gain in exceeding 250° F. since viscosity curves for Ben Franklin crude tend to flatten out in this range.

At present vertical settler temperatures, no difficulty has been experienced with oil entrainment in the effluent brine. However, before the recent heat-exchanger revamping, some oil entrainment in the brine was intermittently encountered.

Water Addition and Brine Concentration

Quantity of water required for emulsifying the crude does not seem to be too critical. It appears that a minimum of 5 per cent volume fresh water injection should be used, but no maximum has been found other than limitations that might be found in added heat-transfer duty due to the presence of additional water. As high as 15 per cent fresh-water charge has been used. However, it must be pointed out that in a water-wash system such as the one outlined, a water level must be maintained. Since the salt concentration of the water level for a given water-flow rate will vary with the salt concentration of the crude, it becomes rather important to check the water-wash salt concentration and control the quantity of water charged accordingly.

It has been found that a concentration of 500 to 1,000 lb. NaCL per 1,000 bbl. water is ideal, not particularly from a washing-efficiency standpoint but as a safety factor since a loss of temperature, exceedingly high pressure drop across the emulsification valve, or some unforeseen factor might cause a carryover of a quantity of this concentrated salt water. However, if one disregards safety factors, it is known from our data that water-salt concentrations on the order of 1,500 to 2,500 lb. per 1,000 bbl. water give a satisfactory water wash.

It is claimed by some refiners that a brine concentration of 2,000 to 4,000 lb. salt per 1,000 bbl. of water is optimum. To expect improved salt removal from the more concentrated brine is quite logical since a greater differential in specific gravities exists between the salt solution and the crude. It is also claimed that stronger brines contain higher concentrations of those demulsifiers which occur naturally in the crude. However, no reasonable correlation could be obtained at this refinery that would show the advantage of one brine concentration over another.

Obviously with refineries where

TABLE 2—ANALYSIS OF H_2O FROM HOT WELL
(pH equals 8.0)

	grains/gal.
Total hardness equals	5.0
Chlorides	4.2
P	.0
M	7.0
Suspended solids	0.4
Dissolved solids	14.1
Total solids	14.5

TABLE 3—ANALYSIS OF WATER FROM VERTICAL SETTLER

	Lb./1,000 bbl. H_2O	Weight (%)
$CaCl_2$	192	19.5
$MgCl_2$	162	16.4
NaCl	634	64.1
Totals	988	100.0

pH equals 7.9
7.6 grains/gal. suspended solids
590 grains/gal. dissolved solids

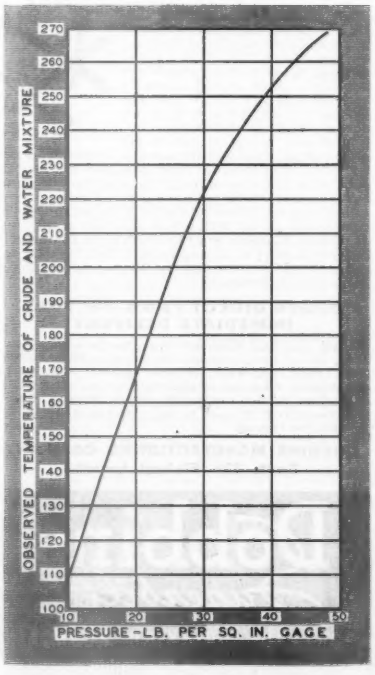

Fig. 5—(Left) Apparent vapor pressure of a composite crude sample plus 10 per cent water

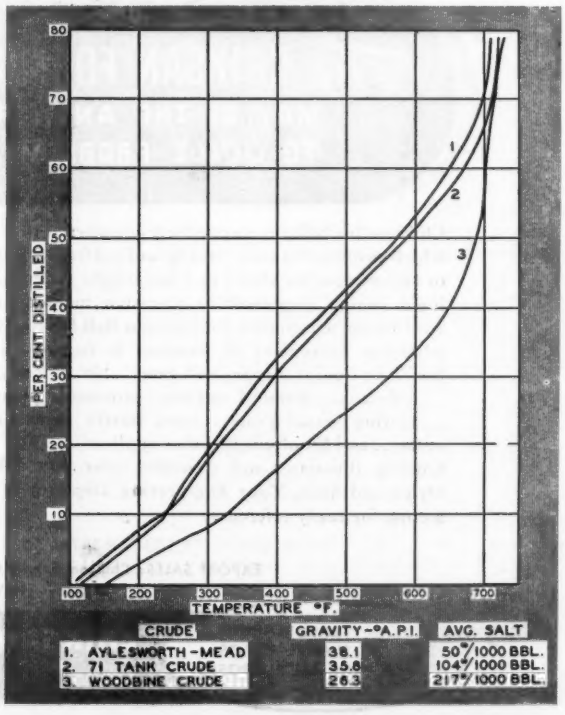

Fig. 6—(Right) A.S.T.M. distillations of various Ben Franklin crude charges

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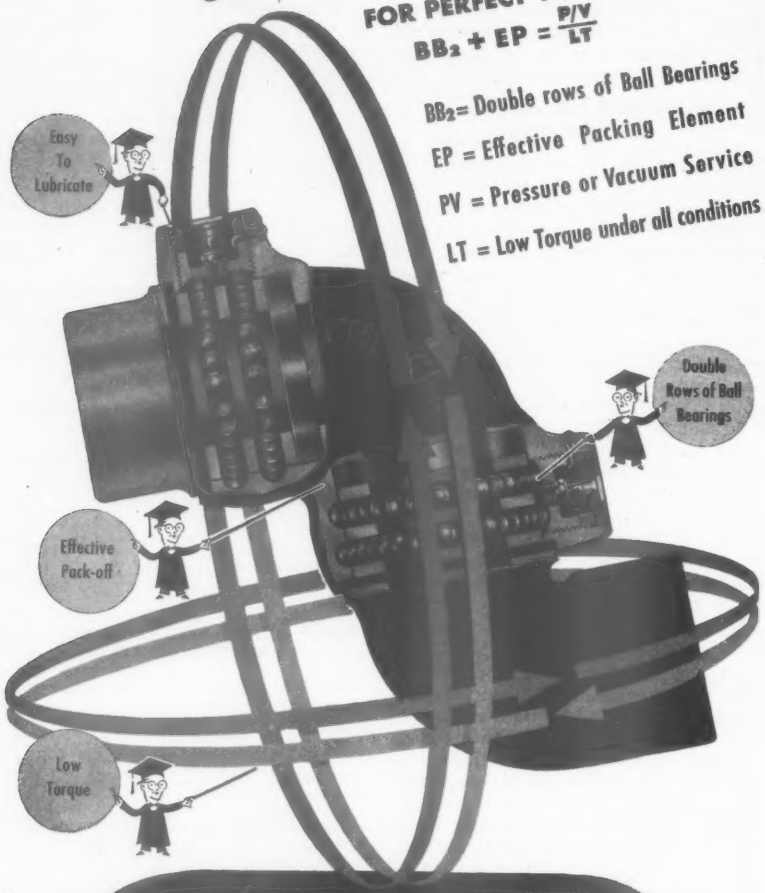

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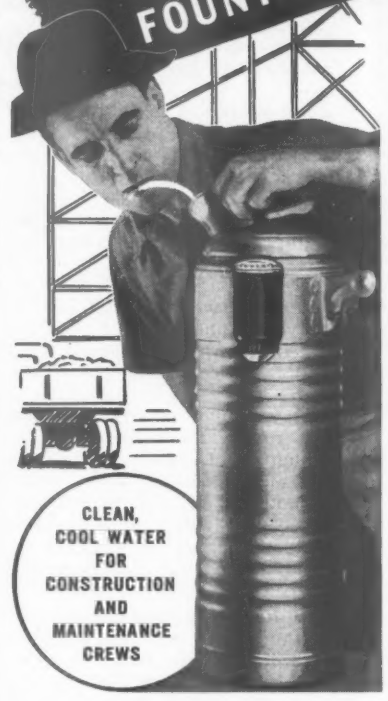

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water is expensive enough to become a definite factor, salt concentration should be regulated for minimum water consumption.

The quality of the water used might be questionable to some. The source of water is a hot well, which at times has a rather high dissolved and suspended solids concentration. (Tables 2 and 3).

Although the conditions of the water might be suspected as slightly erosive or corrosive it has not shown any apparent ill effects. Should any corrosion be found in the vertical vessel at any time in the future, it is planned to install a ¾-in. ganister liner (luminite cement and ground brick ganister).

No trouble has been experienced with fouled heat exchangers as heat-transfer coefficients have remained approximately the same throughout the run. Apparently all solids are discarded with the water drawn from the vertical settler. A definite advantage, however, is assumed in the contact coalescing value of suspended solids when present in the emulsions.

Solids at Water-Oil Interface

Accumulation of solids at water-oil interface which might stabilize water-oil emulsion has not been encountered. However, the try lines are so situated that periodic skimming of the interface would be possible if necessary.

Chemical Addition

Chemical used is Visco No. RM 64. As previously pointed out, it is doubtful if the chemical is needed 95 per cent of the time, but it is good insurance against slugs of heavy crude or tank bottoms.

The amount of chemical currently used is approximately 1 qt. per 500 bbl. of crude charge which represents a cost of 1.0 mill per barrel of crude.

Settling Time

It has often been asked among refiners and designers as to how much settling time is actually required for salt-removal equipment. Some simple tests carried out on the salt-removal system may throw further light on the subject.

TABLE 6—TYPICAL OPERATING DATA
(December-January Operation)

Temp. vert. settler	Pressure drop	Water LV % of crude	Water LV % carryover	Brine concentration lb. NaCl/1,000 bbl.	Crude charge (B/D)	Salt in—lb. NaCl/1,000 bbl.	Salt out—lb. NaCl/1,000 bbl.	Per cent removal	Chemical used qt./day	Chemical cost/bbl. crude, c/day
210	40	5.0	0.4	....	2,885	88	9	90	2	.037
200	35	7.0	0.2	570	2,534	65	10	85	13	.275
200	35	7.0	0.2	1,500	2,550	125	13	89	6	.126
200	35	8.5	0.2	....	2,548	121	7	95	12	.253
200	35	8.5	0.1	....	2,526	120	7	94	12	.256
210	50	11.2	0.7	908	2,441	124	6	95	10	.221
190	50	11.2	0.2	....	2,445	109	13	88	9	.198
195	50	10.0	0.4	796	2,754	121	9	93	6	.117
195	40	10.0	0.4	....	2,721	124	14	89	9	.178
200	45	10.0	0.4	936	2,730	180	13	93	11	.216
185	40	12.0	0.4	584	2,177	101	13	87	8	.197
200	35	7.0	0.2	....	2,500	77	10	87	8	.172
210	35	6.2	0.1	....	2,821	105	10	90	8	.153
195	35	8.0	0.2	....	2,232	120	9	93	0	0
210	35	6.0	0.2	....	3,053	115	11	94	8	.140
200	40	6.0	0.2	....	3,132	163	15	91	10	.171
200	45	6.0	0.2	....	3,100	135	11	91	10	.176
220	50	6.0	0.2	....	3,089	117	11	91	11	.190
200	80	9.0	0.3	1,563	1,983	85	10	88	3	.081
200	*80	9.0	0.8	....	3,601	85	*35	*59	2	.036
210	75	7.0	0.4	1,560	2,500	85	10	88	2	.043
210	†10-15	6.0	0.2	1,572	2,500	87	†35	†60	2	.043
205	50	12.0	0.2	....	2,226	80	6	93	8	.193
210	50	13.0	0.2	1,160	2,000	60	6	90	9	.255
215	‡20	12.0	0.1	2,236	2,000	88	‡18	‡80	8	.215
205	40	10.0	0.2	2,092	3,273	253	26	90	6	.098
200	40	12.0	0.2	724	3,200	69	5	93	6	.101
205	45	12.0	0.2	700	2,809	81	4	95	6	.114
210	45	12.0	0.2	700	2,758	80	2	98	6	.117
200	50	13.0	0.2	400	3,014	85	3	96	6	.107
205	50	12.0	0.1	420	3,014	80	2	98	6	.107
200	50	13.0	0.2	444	2,586	87	7	92	5	.104
210	50	13.0	0.1	....	2,739	60	2	97	6	.118
205	50	13.0	0.1	....	2,700	55	2	97	5	.100
200	50	13.0	0.1	564	2,564	50	2	96	5	.105
205	50	13.0	0.2	450	2,174	65	3	95	5	.124
200	50	12.0	0.1	500	1,977	48	3	94	5	.136
205	50	11.0	0.2	460	1,990	76	2	97	5	.135

*Pressure drop too high, poor emulsion break. †Pressure drop too low, failure of back-pressure valve. ‡Pressure drop too low.

Since a 20-ft. water level is maintained at the bottom try cock of the vertical vessel, samples of crude are available at each of the remaining two try-cock levels, between the horizontal and the vertical settlers, and the outlet of the horizontal. B.s. & w. is occasionally checked at each of these points to determine how quickly the emulsion is taking place. Table 4 shows the "break" obtained during normal operation.

From these data it appears that little settling time is required when a good break is experienced, but for cases of water carryover due to tight emulsion, the advantage of additional settling time seems doubtful. This fact was further substantiated during periods of high water carryover occurring previous to the heat-exchanger revamping as little emulsion break was encountered beyond the vertical settler. The final settler is insurance against faulty operation, i.e., high water levels, etc.

Residence time and velocities throughout the salt settling equipment at 3,000 bbl. per day crude charge are shown by Table 5.

Contact Coalescing

The baffle section is intended to create a turbulent flow and a contact surface to coalesce so far as possible the droplets of water before they reach the vertical settler. Also, if any salt still remains coated with a paraffin sheath, the additional contact in this hot section tends to break down final resistance before entering the vertical settler.

If the baffle had not been satisfactory, it was planned to use a grit or chat as a coalescing medium in the lower section of the vertical.

An ostensible need for the additional contact section was indicated by a microscopic study of raw and washed crude made previous to the addition of the baffle section.

The raw crude showed three different types of crystals; one with definite angular plane surfaces, another in the form of small threads, and a third type which appeared as a black, shapeless mass. Crystals with

TABLE 4—BASIS 3,000 B/D CRUDE CHARGE RATE

No. 1 valve	No. 2 valve	No. 3 valve	Between settler	Out of horizontal
100% water	26%	3%	...	.3%
100% water	6.5%	4.8%	.2%	.2%
100% water	100% water	8.0%	.3%	.2%
100% water	8.0%	3.0%	.2%	.2%

Settling Time Above the Water Level at 3,000 B/D

Charge—Minutes—				
0	11	22	36	117

TABLE 5

Equipment—	Temperature	Residence time	Velocity ft./sec.
Pump to Tc each	70	.....	.....
Exchangers	70-210	3.17 Min.	4.2
Baffles	210	1.08 Min.	1.24
Vertical settler	210	35.5 Min.	*.007
Horizontal settler	208	81.0 Min.	.0074

*Assumed 20-ft. water level.

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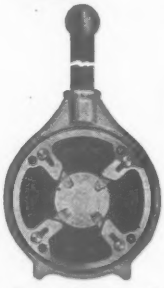

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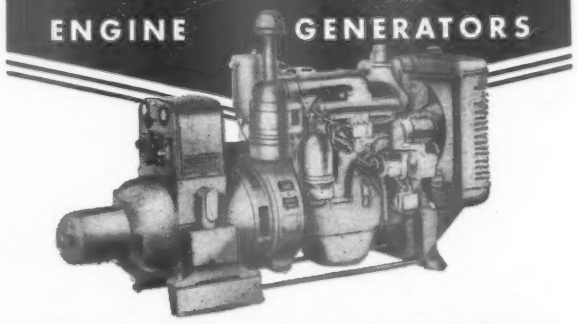

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angular plane surfaces were of various sizes and represented approximately 75 per cent of the total crystallized material. The thread-type material constituted approximately 20 per cent of the total, and the remaining 5 per cent were the black masses of shapeless substances.

Examination of crystals in the washed crude showed only the smallest of the angular plane crystals remaining plus all crystals of the other types.

Crystals of the second and third class were not positively identified as salt crystals since they may have been a form of basic sediment, but it was reasonably concluded that the remaining minute angular crystals were salt.

From these data it seemed that further contact of water with the crystals was necessary after the wax film had been broken with heat.

Obviously the baffle has been beneficial in this capacity since at no time previous to its installation could the salt content of the crude be consistently reduced to as low levels as is currently being accomplished. However, other factors were probably equally important.

A representative month's crude run is shown in Table 7.

TABLE 7

Gravity °A.P.I.	Crude	L.V.%
30	Healdton	}
32	Oscar	} 28
41	Joliff	7
36	Aylesworth	30
36	Mead	7
26	Woodbine	28

Average gravity of month's charge equals 32.0° A.P.I.

A.S.T.M. distillations of various Ben Franklin crude charges are shown by Fig. 5.

U.O.P. K (Characterization factor) estimated from gravity-viscosity correlations vary from 11.9 to 12.2 for various crude charges. This indicated crudes which are predominantly paraffinic in nature.

A composite crude evaluated by Bureau of Mines method also showed the crude to be paraffinic.

Typical operating data are shown by Table 6.

From the data and observations made of operation of Ben Franklin crude charges, the following points should be emphasized.

Best emulsification is obtained with 40 to 50 lb. pressure drop across emulsifying valve.

Temperature within the vertical settler must be maintained for desired emulsion breaking viscosities (200°-220° F.).

Pressure should be sufficient to prevent vaporization (130-150 psig.).

Additional contact of water and crude should be indicated after the crude viscosity has been reduced.

Water should be adequately metered to maintain a constant fresh water charge for a reasonable brine concentration within the vertical settler. (5-15 l.v. per cent of crude charge).

If chemical is used, adequate control and correlation should be utilized to minimize expenditure and obtain optimum results.

Operators must be made a part of this salt-removal program by making all correlations available to them and emphasizing the monetary value of a salt-free product.

George F. Russell, Jr., has been appointed an associate professor and placed in charge of the natural gas section of the petroleum engineering department of Louisiana State University. He formerly was a member of the chemical technical staff of Standard Oil Co. of New Jersey, on the faculty of the chemical engineering school of the University of Oklahoma and in the natural gas and gasoline department of Phillips Petroleum Co.

E. V. Murphree, manager of the research and development division of Standard Oil Development Co. since 1944, has been elected executive vice president. **Douglas G. Tomkins,** in charge of the company's general business and accounting department, has been made assistant treasurer.

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RYERSON

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Books for Plant Workmen

I am an operator in a small refinery and would like to read about the things that I am doing in the refinery. What books should I get?—F.A.S.

Many inquiries for nontechnical or semitechnical books come to this department and hence a list of such books is published here. The books are arranged somewhat in the order of how difficult they are, starting with a small picture book for children.

The entire set of books can be had for less than $25.00 and the last three by Stevens constitute about half the cost. The books by oil companies are usually free and it should be noted that many oil companies as well as those that are listed (Shell Oil Co., Inc., and The Texas Co.) have similar books or equivalent publications. A good general knowledge of the industry can be had by proceeding through the list of books starting with No. 2 and stopping at whatever degree of advancement is desired or possible for the particular student.

Item 3 entitled, "Simplified Petroleum Chemistry and Physics" deserves particular attention because it explains somewhat technical matters in simple words, by analogies to commonplace occurrences, and by extensive use of pictures or sketches. The book proceeds from the simplest operations to a description of each of the common petroleum tests or properties and finally to the more complex operations of petroleum refining but in no case resorts to complicated theoretical discussions.

Items 2, 4, 5, 6, 7 and 8 pertain to the entire industry, that is, history, geology, exploration, drilling, transportation, etc., as well as refining, chemistry, and the performance of products. Each of them, however, places major emphasis on a different phase of petroleum refining, or treats certain phases more successfully than others, such as:

2. Petroleum Products — Refining processing, flow charts and utilization of products.
4. Earth Oil—Historical.
6. A Petroleum Handbook — Performance and utilization of products.
7. The Amazing Petroleum Industry—Chemistry and specialty products.
8. Fundamentals of the Petroleum Industry — Technical and statistical data.

Finally, the three books by M. M. Stevens (Item 9) are textbooks used in correspondence or extension work in natural-gas and refinery engineering. Volume 1 consists primarily of fundamental arithmetic, mathematics, physics, chemistry, etc., only indirectly related to petroleum. Volume 2 introduces general processing, petroleum chemistry, treating, etc., and Volume 3 proceeds to more advanced studies of equipment, its design and operation.

Reference Books

1. Petersham M & M—The Story Book of Oil—John C. Winston Co., Philadelphia, 1935, 30 pp.
2. The Texas Co. — Petroleum Products (and related charts, etc.), 154 pp.
3. Petroleum Educational Institute—Simplified Petroleum Chemistry and Physics, 704 Spring St., Los Angeles, 1943, 122 pp.
4. Egloff, G.—Earth Oil, The Williams & Wilkins Co., Baltimore, Md., 1933, 158 pp.
5. Crowther, J. G.—About Petroleum, Oxford Univ. Press, New York, 1938, 181 pp.
6. Royal Dutch-Shell Staff—A Petroleum Handbook, The Asiatic Petroleum Co., Ltd., London, 2nd Ed., 1938, 473 pp.
7. Kalichevsky, V. A.—The Amazing Petroleum Industry, Reinhold Publ. Corp., New York, 1943, 234 pp.
8. Hager, Dorsey—Fundamentals of the Petroleum Industry, McGraw-Hill Book Co., New York, 1939, 445 pp.
9. Stevens, M. M.—Vol. 1 Petroleum & Natural Gas Engineering, 1941, 536 pp.; Vol. 2 Petroleum Refining, 1941, 522 pp.; and Vol. 3 Petroleum Refining, 1943, 419 pp. Pennsylvania State College at State College, Pa.

Motor Oil Definition

We understand that a new grading system or way of naming lubricating oils is in use. Can you direct us to a definition of the new oils?—G. R. R.

The question probably refers to the Definitions of Motor Oils adopted by American Petroleum Institute and sponsored or discussed by certain agencies such as Society of Automotive Engineers and General Motors Corp. A recent discussion of this topic was presented by H. R. Wolf of the research laboratories division (General Motors Corp.) before the January 11 annual meeting of S.A.E. in Detroit.

Definitions recommended by the A.P.I. lubrication committee and adopted by the general committee, division of marketing, July 17, 1945, are:

Regular motor oil.—This term shall be used to designate a straight mineral oil. Oils of this type are generally suitable for use in internal-combustion engines under moderate conditions.

Premium motor oil.—This term shall be used to designate an oil having proved oxidation stability and bearing-corrosion-preventive properties. Oils of this type are generally suitable for use in internal-combustion engines where operating conditions are such that regular oils do not give satisfactory service.

Heavy-duty motor oil.—This term shall designate an oil having proved oxidation stability, bearing-corrosion-preventive properties and detergent-dispersant characteristics. Oils of this type are generally suitable for use in both high-speed diesel and gasoline engines under heavy-duty service conditions.

Objections have been raised, particularly to the use of the word premium, to describe an oil of intermediate quality. Others think that the definitions are too general to be of help and still others object because the definitions are too specific. Generally, it would seem that the definitions are so general that they will be of little value and at the same time they will do little harm or should create no stern opposition.

Obviously the S.A.E. classification of motor oils which is based on viscosity alone, and viscosity at only one temperature, is inadequate. Nevertheless, the difficulty in devising a fair, useful, and simple system for classifying motor oils is so formidable that we must somehow get along with S.A.E. numbers and the definitions given above.

Butadiene Analysis

Can you direct me to a good method for determining butadiene in gases?—F. R. P.

The procedure for analysis is published in U.O.P. Laboratory Test Methods (Universal Oil Products Co., Chicago) and was described on the Questions on Technology page of January 22, 1942, page 41, of The Oil and Gas Journal. The discussion also lists a number of references to the older literature. More recently a modification of the equipment was discussed by Charles L. Gregg (Apparatus and Procedure for Technical Butadiene Analysis) on page 728 of the Anal. Ed. of Ind. & Eng. Chemistry, Vol. 17, No. 11, November 1945.

The methods all involve absorption or reaction of butadiene with maleic anhydride. The methods are entirely satisfactory although they are somewhat cumbersome because maleic anhydride must be kept melted by a water bath, because the reagent lasts only a short time, and because the anhydride must be brought into equilibrium with the other four-carbon atom gases in the sample. The last difficulty requires two contactings or determinations (the first of which is purely to gain equilibrium with the other C_4 hydrocarbons) whenever a gas of definitely new composition is encountered.

Engineering Fundamentals

No. 230

A FEATURE OF THE OIL AND GAS JOURNAL

Fault Trap Reservoirs

FAULTING, being the result of the same earth forces that bring about the folding of strata, is often present in oil-bearing formations, and must be considered as a factor in oil accumulation. Faults sometimes fracture a porous stratum, formerly barren of oil, and interpose a stratum of impervious clay or shale across the faulted face in such a way that a structural trap is formed in which oil may subsequently be concentrated. Such a trap is termed a fault trap.

Normally a reservoir in a fault trap is sealed at the fault plane by impermeable strata placed against the reservoir bed by the action of faulting. However, fault planes lined with thinnest veneers of plastic clay or pulverized fault gouge of low permeability may separate oil reservoirs from water-logged porous sands which they contact at the line of faulting. This is particularly noted in shallow, low-pressure, and heavy-oil reservoirs.

Furthermore, fine sand of low permeability has been observed to provide a seal at the resulting coarse-fine interface. Such a barrier may break down when the reservoir pressure is lowered by withdrawals allowing water to invade the reservoir across the fault plane. Evidently reservoir pressures and viscosity of oil play a significant part in the problems of fault traps, and apparent sand-to-sand contact at a fault plane need not condemn the chance of trapping, as an effective seal may be present under the conditions mentioned.

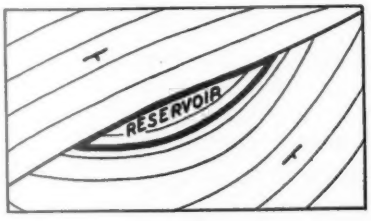
Fault Segment Reservoirs

The simplest-type fault trap reservoir is formed when a single fault acts as a barrier in conjunction with structural closure against the fault plane. Such reservoirs have a single trap and are termed fault-segment reservoirs. The most common of these reservoirs occur on the axes or on the flanks of faulted anticlines, type 1, Fig. 2; on faulted structural noses, reservoir 3 of Fig. 2; and along en echelon fault zones on regional monoclines, reservoir 5 of Fig. 2. Examples of the latter type occur along the Mexia fault zone. Strongly folded anticlines are usually disturbed by reversed faults, which are mostly longitudinal and give rise to typical reservoirs located on underthrust flanks, reservoir 4 of Fig. 2.

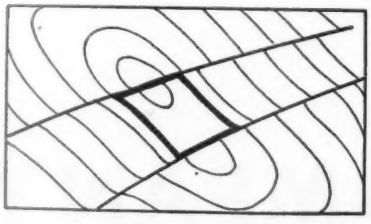
Faults are usually incidental trapping agencies in the structural culminations of anticlines and domes. Reservoir areas are either cut short by faults (reservoir 1, Fig. 2), or a reservoir extends through a number of crestal fault blocks and represents a composite convex trap reservoir with a common water level. In this latter case the faults have not acted as barriers in the process of adjustment of the accumulation. During the short period of exploitation, however, separate drainage behavior may or may not appear in different blocks.

Fault Block Reservoirs

When more or less parallel faults act as barriers, a double-trap reservoir, termed fault-block reservoir, is formed (Fig. 1). Individual reservoirs of this type occur mainly in block faulted regions, and the structures enclosed by such faults are horsts, grabens, and fault steps. Although the so-called "central graben" is a common structural feature at the apex of faulted anticlines and domes, fault-block reservoirs in these structures are quite rare. The reservoirs which occur in central graben blocks are more commonly restricted to the structural culmination which is ordinarily found inside the "central graben," and in most cases are simple convex trap reservoirs.



FAULT—SEGMENT RESERVOIR



FAULT—BLOCK RESERVOIR

Fig. 1—Fault trap reservoirs

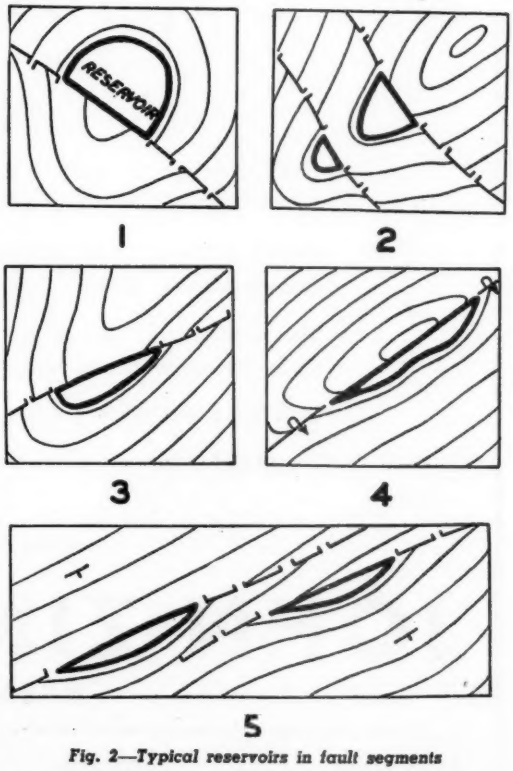


Fig. 2—Typical reservoirs in fault segments

Series prepared by Dr. O. Welhelm, Shell Oil Co., Inc. (A. A. P. G. Bulletin Vol. 29, No. 11)

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Available for vertical or horizontal firing.

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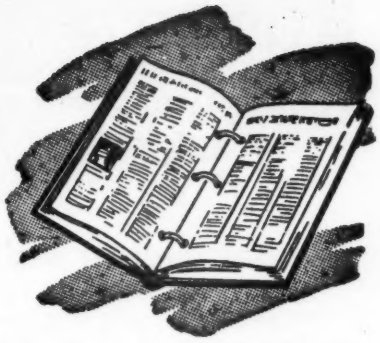
The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL



Coefficient of Expansion

THE volume of liquid oils at elevated temperatures can be obtained from the figure on this page. It may be used for pressures below 300-400 psi. but at higher pressure the curvature of the lines is less. They originate at nearly the same values at low temperatures and nearly pass through the values shown for the critical temperatures.

Example 1.—Specific gravity decreases with temperature whereas volume increases inversely. Thus a 33°-A.P.I. material (specific gravity 0.86 at 60° F.) will at 600° F. have a specific gravity of only 0.64. The volume of each gallon or cubic foot or barrel, etc., will increase by this ratio:

$$\frac{0.86}{0.64} = 1.334$$

Similar ratios may be used for any starting temperature—not 60° F. alone.

At High Pressure

At an exceedingly high pressure the curvature of the 33° A.P.I. will be less and it will slope downward more steeply to the value of 915° F. This means that in general the volume change will be greater than the 1.334 found above.

For approximations, the number of degrees required to change the volume by 1 per cent is useful:

A.P.I.	°F. that changes volume 1%
0-17	30
7-20	25
20-30	20
30-43	15
43-67	10

These values are not accurate when used out to sharply curving parts of the curves. For very low temperatures (up to 200° F.) somewhat larger values (15 to 30) should be used.

Example 2.—The oil of Example 1 passes through 600° minus 60° or 540° F. Dividing this by about 16 shows an increase in volume of about 34 per cent, or the factor similar to that of Example 1 would be 1.34.

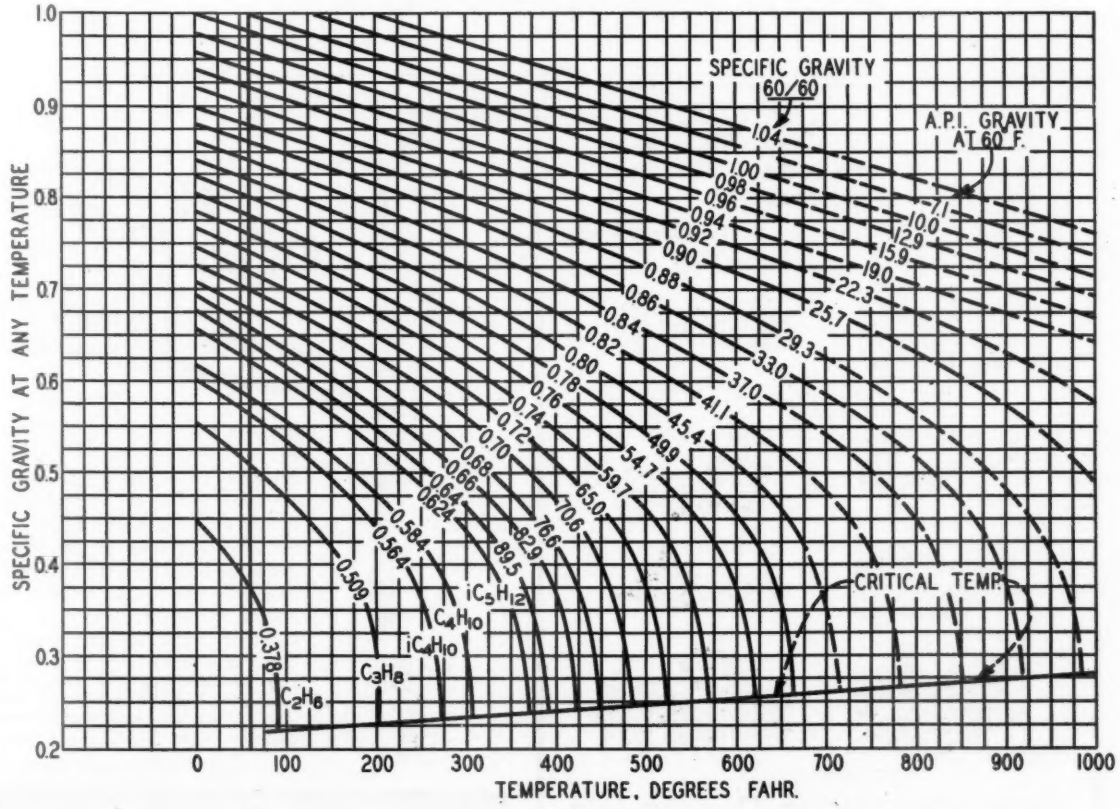


Fig. 1

No. 88 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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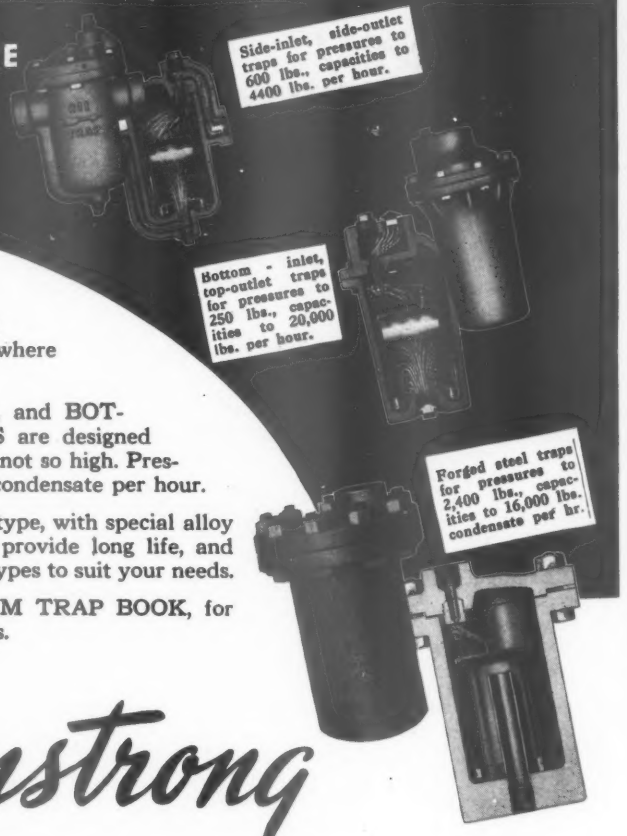
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Forged steel traps for pressures to 2,400 lbs., capacities to 16,000 lbs. condensate per hr.

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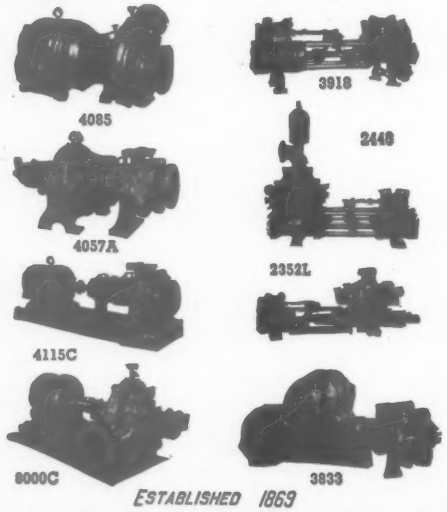

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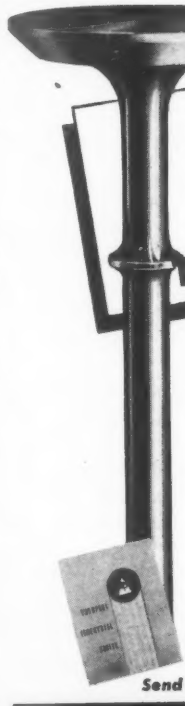

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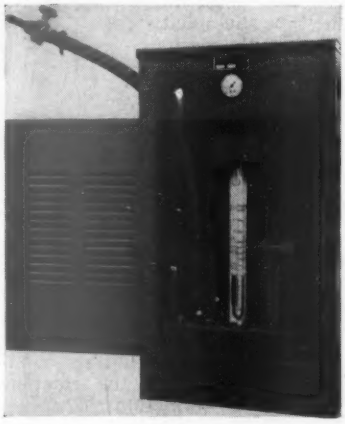
OIL AND GAS EQUIPMENT Digest

IT'S NEW ✓ CHECK IT

by Joe Cahill

(1) PORTABLE CHLORINATOR to introduce chlorine into water in cooling towers, boilers, and other industrial equipment, operates on vacuum principle. Handles up to 1,000 lb. of chlorine every 24 hours, with 4 per cent control. Silver, glass, and hard rubber used in all parts in direct contact with the chlorine. No float boxes, float valves, nor other moving parts. Enclosed in steel cabinet for protection against breakage. Check valves prevent moisture backup when not in operation. *Paddock Engineering Co. of Texas.*



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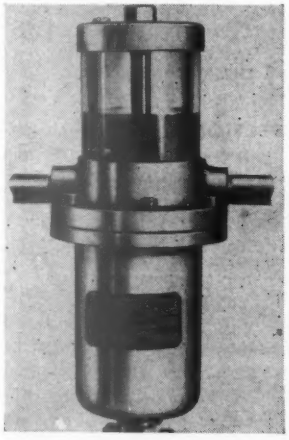
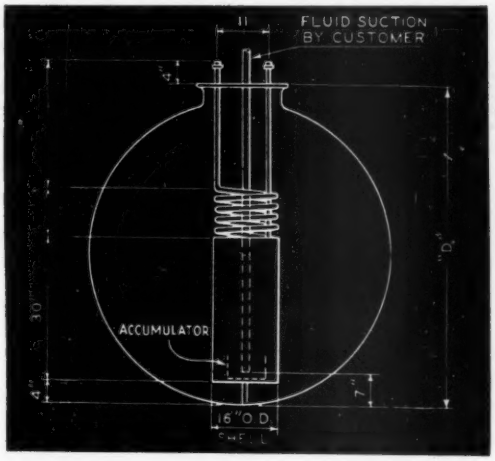


(2) LUBRICATING FILTER FOR PNEUMATIC EQUIPMENT features a plastic lubricating-oil reservoir. A needle-valve oil regulator, easily adjustable, permits the correct amount of oil to mix with filtered operating air. The lower element is composed of a sludge basin and an all-wool felt medium. Fully automatic in operation, the device filters incoming working air, and provides a finely adjusted lube mist. The filter is interchangeable and reconditionable. *CCA Products Engineering.*

IT'S NEW ✓ CHECK IT

(3) NEW BULK TANK PREHEATER can be made to fit any size tank having a manhole 16½ in. or larger. Provides 38 sq. ft. of direct radiation surface, plus 10 sq. ft. of secondary shell heating surface. Has flow accumulator which makes it necessary for liquids to flow over the coils before entering the suction line. Built for use with steam or hot water as desired. *Rempe Co.*



IT'S NEW ✓ CHECK IT

(4) OIL WELL PUMP VALVES designed and built to give the oil producer the maximum in service per run. By dividing the drops, or drop and ball, into separate units parts are lighter, and reduce excessive wear on valve-seating faces. Placing the outer cup shape drop over the inner drop or ball, which is provided with ample clearance, produces independent flexible double seating on the seat face, as well as on the double drop faces, or drop and ball faces. Fluid slippage over the seat face is practically overcome due to the double drops working

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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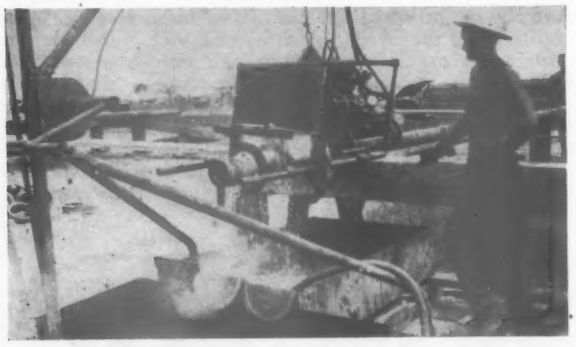
independent of each other. Seat easy, and will not spin and hammer cage wings. Have built-in material for reconditioning. *Deep Wells, Inc.*

IT'S NEW CHECK IT

(5) SIDE-HOLE CUTTER, for use in combination with any conventional rock bit, is installed above the bit, which places it less distance off bottom than the diameter of the hole. Eliminates reaming as separate operation, stabilizes the drilling bit, and prevents the hole from going off vertical; 10 and 12-point side-hole contact. Easy handling and foolproof operation. Tests have borne out manufacturer's claims. (Patent applied for). *Globe Oil Tools Co.*

IT'S NEW CHECK IT

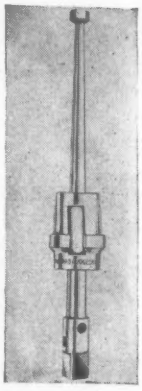
(6) FLAME HARDENING TOOL JOINTS. New equipment devised to flame harden tool joints on the pipe and in the field eliminates delay in drilling operations and removal and transportation of joints. Hardens 50 joints in 8 hours. Truck-mounted equipment carries everything required and can be used in any location the truck can get into. Process gives a hardened case 5/32



to 3/16 in. deep, leaving a soft core. Wear curves have indicated probable average life of hardened string is 275,000 ft., while the probable average life of an unhardened string was 90,000 ft. Wear per thousand feet drilling before hardening 0.006 in., after hardening, 0.0017 in. *Houston Heat Treating Co.*

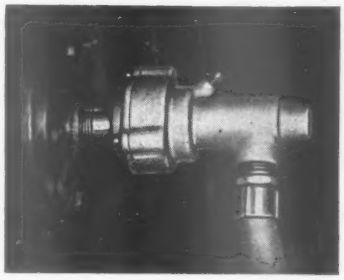
IT'S NEW CHECK IT

(7) A NEW TUBE EXPANDER serves for all general boiler work. Designed with a minimum of parts—frame, rolls, and mandrel. May be readily dismantled and new rolls quickly inserted. Frame is one-piece heat-treated steel. Mandrel and rolls are hardened tool steel. Rolls are extra long and reversible for double length of service. Set at an angle for self-feed. Reversing the mandrel releases the expander from the tube. They bear on the end of the tubes; do not draw tubes out of the tube sheet and roll the tube ends for their full length. Furnished for hand or combination hand and power use. *Richard Dudgeon, Inc.*



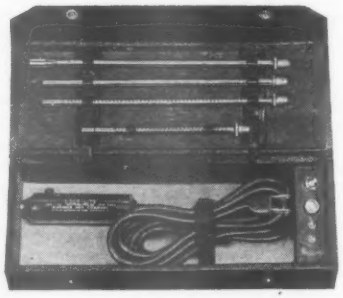
IT'S NEW CHECK IT

(8) ROTATING WATER JOINT handles water for cooling revolving shafts, cylinders, and drums, or liquids for heating up to 200° F. This union utilizes helical groove on the rotor running counter to the rotation. Maximum clearance between shaft and housing of 0.0005 in. Rotor concentricity held to 0.001 in. t.i.r. Bronze housing and stainless steel rotor resist corrosive action of any liquids used for heating or cooling. Made in two types, monoflow and duoflow. Can be manufactured from ¼-in. to 6-in. i.p.s. *Deublin Co.*



IT'S NEW CHECK IT

(9) NEW MINIATURE INSPECTION LAMP makes it possible to inspect cylinders, gear housings, tubes, rifle barrels, pipes, and other equipment having openings as small as 5/16 in. Small light-reflecting and glareless metal-protected tungsten bulbs attached to flexible or rigid extension focus a maximum amount of light on the proper place. Power supplied through a rubber-insulated wire cable to a transformer enclosed in handle. Additional extensions with lengths up to 32 in. in flexible, semirigid, rigid, and rigid-angle construction available. Small, attachable, reflecting mirror is available for inspection of areas not in direct line of vision. *Harmon & Co.*



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(10) LIGHT OIL-BASE MUD for drilling depleted or weak zones into lower pressures than previously permissible. Makes up 60 lb. per cu ft., allowing zero filter loss and free flow of cuttings. *Oil Base, Inc.*

IT'S NEW CHECK IT

(11) WHEEL, PULLEY, AND GEAR PULLER features independent pulling and gripping actions. Securely locks the hooks so that they will not slip off, and applies the grip equally on all sides. Pulls anything from ⅝-in. gear to 40-in. wheel or hub. *The Scott & Ewing Co.*

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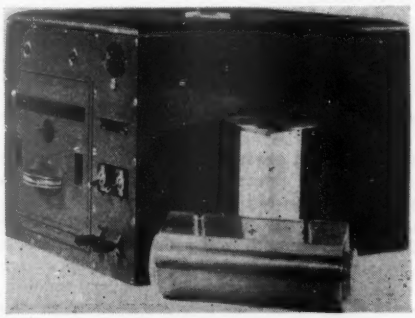
(12) NEW FEATHERWEIGHT CUTTING TORCH is designed for the user who needs a medium-sized cutting torch to do light metal cutting but occasionally needs to cut heavier materials as well. Weighs 2 lb., 2 oz., cutting down worker fatigue. Only 16 in. from tip to butt

of handle. It has a ribbed brass handle, tubes of nickel-copper alloy in triangle assembly, either 80° or 90° forged head, and one-piece tellurium copper tip. *Wall Chemicals Div. of Liquid Carbonic Corp.*

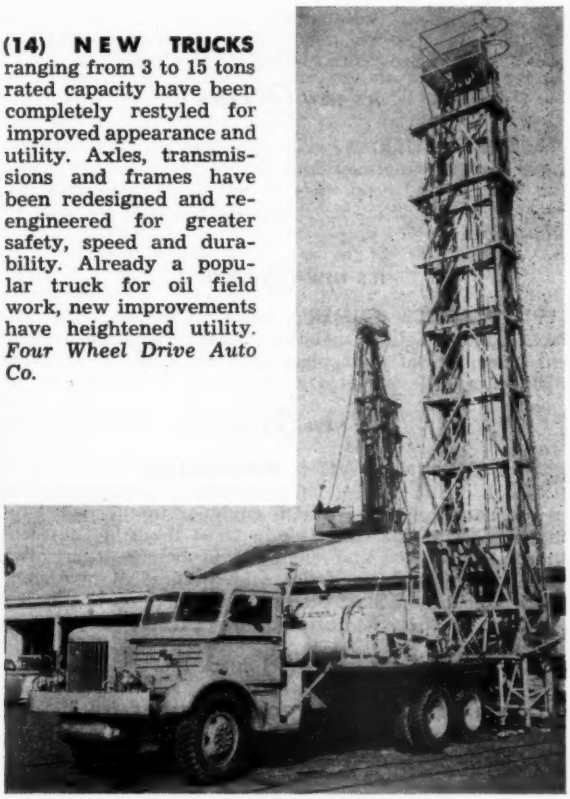
IT'S NEW CHECK IT

(13) RECORDING OSCILLOGRAPH designed to meet the demands for lightweight, precision-built geophysical equipment, weighs but 52 lb., and measures 10 in. in height, 11 in. in width, and 14 in. in length. Features a removable timing fork and amplifying unit for simultaneous viewing and recording. Records 6 to 18 traces in 6-in. paper. *Coleman Instrument & Mfg. Co.*



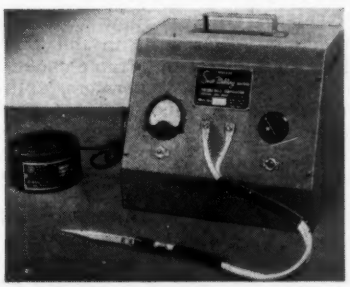
IT'S NEW CHECK IT

(14) NEW TRUCKS ranging from 3 to 15 tons rated capacity have been completely restyled for improved appearance and utility. Axles, transmissions and frames have been redesigned and re-engineered for greater safety, speed and durability. Already a popular truck for oil field work, new improvements have heightened utility. *Four Wheel Drive Auto Co.*



IT'S NEW CHECK IT

(15) SPOT-WELDING MACHINE for welding small parts from 0.0005 to ⅛ in. round or thick. Eliminates the problem of holding small work to effect the weld. Tweezer tips may be filed or shaped to accommodate oddly formed units. Extremely versatile, and should be the answer to many welding problems in the instrument field. *Tweezer Weld Corp.*



IT'S NEW CHECK IT

TRADE LITERATURE

(16) BRAND NEW CATALOG of petroleum products testing equipment features guide to principal tests of petroleum products, complete list of A.S.T.M. and A.P.I. hydrometers and thermometers, together with many instruments for miscellaneous testing and general laboratory use. Complete descriptions of all instruments are given throughout the catalog. *C. J. Tagliabue Division.*

IT'S NEW ✓ CHECK IT

(17) "STEEL TENDONS OF MODERN INDUSTRY" is a multicolored booklet consisting of 90 per cent illustration and 10 per cent explanatory matter. Shows complete process in the manufacture of wire rope. Nontechnical descriptions of wire-rope construction and uses are also included. *Union Wire Rope Corp.*

IT'S NEW ✓ CHECK IT

(18) SOFT WATER. New 20-page booklet covers the various uses to which softened water can be put. Presents the benefits and economies of soft water. Describes also manufacturer's line of water-conditioning equipment. *Elgin Softener Corp.*

IT'S NEW ✓ CHECK IT

(19) "PLASTICS PRIMER" contains simple and brief facts about phenolic plastics. Table giving outlines of characteristics of these plastics is included. Products are pictured and described. *Durez Plastics & Chemicals, Inc.*

IT'S NEW ✓ CHECK IT

(20) DESIGNING WITH MAGNESIUM, a veritable textbook on the subject of this wonder metal should be in the hands of every design engineer in the petroleum industry. The 323 fact-filled pages describe physical, thermal, electrical and chemical properties, fabricating methods and characteristics and mechanical characteristics. One of the best pieces of information the Digest has been privileged to offer. *American Magnesium Corp.*

IT'S NEW ✓ CHECK IT

(21) TEMPERATURE CONTROL INSTRUMENTS. New 16-page catalog, well illustrated, describes in detail this manufacturer's complete line of temperature-control instruments, including relays—mercury plunger and sensitive types—thermostats and thermo-regulators. Uses of these include constant temperature control of ovens, heating baths, refrigerants, incubators, etc. *H-B Instrument Co.*

IT'S NEW ✓ CHECK IT

(22) MOTORS AND GENERATORS. A new two-color brochure describes in detail typical units in the "FB" frame, designed to allow both base and frame mounting. Permanent-magnet a.c. and d.c. generators, split-field d.c. motors, permanent-magnet d.c. motors, series and universal motors, and shunt-wound d.c. motors are pictured and described in detail. Facilities for special design are noted. Construction and characteristics of all types are given, and performance curves shown for the typical units selected. Standard dimensions and cutaway view are shown for engineers' interest and convenience. *Electric Indicator Co.*

IT'S NEW ✓ CHECK IT

(23) pH EQUIPMENT. This catalog describes in detail continuous pH controllers and recorders, including electrode assemblies and accessories. Includes also engineering and technical information relative to pH theory and measurement. Some installations are described with chart records and flow diagrams included. *The Bristol Co.*

IT'S NEW ✓ CHECK IT

(24) WELDVALVE CATALOG illustrates new valve construction in gate, globe and angle designs from 600 through 2,500-lb. standards. New designs eliminate or neutralize valve joints, seat ring joints, and improved packing gland joints, as well as saving 30 to 60 per cent in weight and space. *Manning, Maxwell & Moore, Inc.*

IT'S NEW ✓ CHECK IT

(25) UNDERWATER CUTTING AND WELDING. New 10-page booklet describes the arc-oxygen process for the cutting of steel under water and for cutting cast iron and high-alloy steels in open air. Gives considerable working data and procedure information. Electrodes for underwater welding and cutting and instructions for their use are included. *Metal & Thermit Corp.*

IT'S NEW ✓ CHECK IT

(26) RETURN BENDS. Method of casting and its effect on physical properties of return bends is the subject of an 8-page bulletin which also includes cutaway drawings, tables of dimensions, and maximum operating pressures. Casting techniques are illustrated. *The Ohio Steel Foundry Co.*

IT'S NEW ✓ CHECK IT

(27) ENGINE BLOCK AND RADIATOR REPAIR EQUIPMENT. New 12-page booklet covers mechanical method of stopping and repairing engine-block cracks as well as the equipment needed for such repairs. Tool sets and individual pneumatic tools and accessories are included. *Kerkling & Co.*

IT'S NEW ✓ CHECK IT

(28) FEED-WATER CONTROL SYSTEM. The world's largest boiler, with continuous steam generating capacity of 600,000 lb. per hour at 1,825 psi. and temperature of 960° F. at the superheater outlet, recently erected at Fall River, Mass., necessitated many changes in existing feed-water control system. The main features of this newly designed system are included in 16-page performance report put out by builder. *Northern Equipment Co.*

IT'S NEW ✓ CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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Natural Gas

Unitization Advocated At Natural-Gas Hearing

AUSTIN, Tex. — The interests of both conservation and property owners are best served by unitized operation of oil and gas fields, the Texas Railroad Commission was told in a hearing here.

The witness was J. O. Lewis, Houston geologist and engineer, who appeared in behalf of Chicago Corp., which is opposing a proposal of Southern Minerals Corp. to reinject residue gas into the gas cap in Stratton field, Nueces County, through wells on Chicago Corp.'s property. Lewis disagreed with the theory that a well's position entitles it to more oil than another. He said in gas cap fields the commission's rules favor a well situated low on an oil structure and penalize one situated higher, unless there is a unitization agreement for the field. Testimony that reinjection of the gas to the Stratton field's cap would increase ultimate oil recovery was given at the hearing by John Crutchfield, Humble Oil & Refining Co. engineer.

February Natural-Gas Sales Show 0.8 Per Cent Gain

NEW YORK. — February sales of natural gas gained 0.8 per cent according to the American Gas Association which stated that the increase showed February 1945 sales of 2,310,129,000 therms compared with 2,328,745,000 therms for February of this year. The association's natural-gas sales index for February was 188.1 (1935-1939 = 100).

For the 12 months ending February 28, 1946, natural-gas sales approximated 21,939,556,000 therms, a decrease of 2.6 per cent compared with the same period last year.

Revenue from the sales of natural gas for the fourth quarter of 1945 showed a decrease of 1 per cent, dropping to $171,587,000 compared with $173,351,900 for the same period in 1944, A.G.A. stated. Natural-gas revenues were estimated by A.G.A. at about $691,500,000 in 1945 compared with $676,700,000 in 1944, representing a 2.2 per cent increase.

Sales estimated at 2,149,300,000,000 cu. ft. in 12 months ending December 31, 1945, declined 0.4 per cent, reflecting the decreased volume of industrial and electric generation sales. Residential sales gained 7.9 per cent.

One therm equals about 100 cu. ft. of natural gas.

Competition Held Possible From Coal Gas Process

CHICAGO.—The possibility of successful competition in price with natural gas has been advanced here for a new method of community home heating through the limited gassification of pulverized coal.

The process was described here by A. D. Singh, supervisor of the coal and gassification section of the Institute of Gas Technology, a division of the Illinois Institute of Technology. Singh was attending the Midwest Power Conference sponsored by the Illinois Institute in cooperation with nine Middlewestern universities and eight technical societies.

Committee Named to Study Louisiana Gas Proration

NEW ORLEANS.—A committee to study the feasibility of prorating natural-gas production in Louisiana was set up at the conclusion of a statewide hearing here by the Louisiana Conservation Commission.

At the meeting, pipe line company representatives indicated their willingness to cooperate but submitted a 10-page brief listing "questions that must be satisfactorily solved" before any allocation order can be considered.

Members of the committee are P. A. Frye, executive director of natural-gas conservation for Louisiana; E. L. Richards, special gas attorney for the state; C. H. Lyons, Shreveport oil and gas producer; staff members of the conservation commission, and three attorneys representing pipe-line companies.

Gas Injection Authorized

AUSTIN, Tex.—Lone Star Producing Co. has been authorized by the Texas Railroad Commission to return gas produced from the Pettit and Travis Peak zones in the Opelika field to the Rodessa reservoir after it has been processed for the extraction of liquid products. The commission's order allows the processed gas to be injected or marketed to relieve pipe line demands upon the Rodessa sand.

Natural Gasoline

Light Products Output Gain Shown in Report

WASHINGTON.—A rising production coupled with a falling demand characterized natural gasoline statistics for January as reported by the United States Bureau of Mines.

Production of natural gasoline and other light products rose more than 2.5 per cent over December and nearly 3 per cent over January 1945. Shipments of natural gasoline to refineries, however, dropped 9 per cent from December 1945, and stocks of light products at refineries, plants and terminals increased more than 27 per cent over the December inventories.

Daily average production of all light products in January stood at 13,389,000 gal. compared to 13,048,000 in December and 13,011,000 in January 1945. Refinery demand for natural gasoline dropped from 206,036,000 gal. in December to 188,971,000 gal. in January. Natural gasoline stocks rose from 101,726,000 gal. in December, to 129,508,000 gal. in January.

That some of the decreased refinery demand for natural gasoline is seasonal is shown by the fact that shipments to refineries in January 1945 totaled 177,748,000 gal. even lower than the January 1946 figure.

January, however, saw an increase in demand for liquefied petroleum gas used for fuel. Demand for this product rose from 71,577,000 gal. in December to 75,920,000 gal. in January. Production of commercial butane-propane mixture was 41,419,000 gal. as compared to 39,838,000 gal. in December and 31,135,000 gal. in January 1945.

Work on New Shell Plant Due to Start by May 1

MIDLAND, Tex.—Construction of a new natural gasoline plant by Shell Oil Co., Inc., in the TXL field of West Texas is due to get under way by May 1.

The plant is expected to have a minimum capacity of 30,000,000 cu. ft. daily. The equipment to be installed will allow operating pressures of about 200 psi. to obtain a high yield of butane.

Reports here are that contracts are being negotiated with El Paso Natural Gas Co. for the sale of all residue gas from the Shell plant. Cost of the plant is unofficially placed at around $2,500,000. It is due to be erected on the Shell-Cities Service TXL "D" lease.

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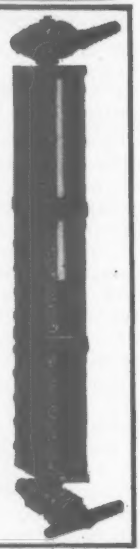

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REFINING

More Protests Made by Industry on Lead Cut

Fresh criticism of the action of the Civilian Production Administration in cutting allocation of lead for use in the manufacture of premium gasoline came last week from two directions.

William A. Boyd, Jr., president of the American Petroleum Institute, said the decreased lead supply will result in "a recurrence of wartime annoyances and difficulties to millions of motorists." Unless the ruling is modified before May 1, Boyd said, it will disrupt the marketing machinery of the petroleum industry and force readjustment of many cars, buses, and trucks to poorer grades of fuel "at incalculable cost."

"A serious mistake from the standpoint of agriculture" was the way Howard A. Cowden, president of Consumers Cooperative Association, described the reduction. "It means a return to wartime fuel qualities when food production goals require maximum power and service from high compression motors on farms," he said in a letter to CPA. He called for incentive price increases to boost lead production rather than the cut in the allocation "and the consequent dislocation of the industry." Cooperative Refinery Association is a subsidiary of Consumers Cooperative.

The Western Petroleum Refiners Association at its recent meeting in Fort Worth voted a resolution condemning the reduced allocation. CPA allocated 3,500 tons of lead for the manufacture of tetraethyl lead for April. About 17,500 tons was used the last quarter of 1945, and 14,000 tons in the first quarter of 1946.

U. S. Sells Surplus Gasoline In Newfoundland, Shanghai

WASHINGTON.—The Government netted nearly 12 cents a gallon in its sale of two lots of high-octane aviation gasoline totaling 1,250,000 gal. in Newfoundland, reports of the Office of the Foreign Liquidation Commission have disclosed.

The two lots were sold for $148,900. Detailing supplies of petroleum products sold and offered for sale throughout the world, the office also reported the disposal of 8,000,000 gal of aviation gasoline and 100,000 gal. of aviation lubricating oil in the Shanghai area for $1,821,000.

Items currently being offered include 2,000,000 gal. of bulk aviation gasoline in the Canal Zone with small amounts at David, Panama, and in Peru. Additional aviation gasoline in 55-gal. drums and some packaged oils and greases is available in Colombia, Ecuador, and Peru. In North Africa are 14,000 drums of asphalt and 660 drums of asphalt emulsion. Packaged petroleum products valued at $900,000 are in the Philippines. Included among these are 30 and 55-gal. drums of lubricating oil, 5-gal. cans of recoil and cutting oils, and 10 to 25-lb. cans of greases. Aviation gasoline totaling 205,000 gal. is for sale on Marcus Island.

High-Purity Heptane Produced by Phillips

BARTLESVILLE, Okla. — Production in drum or tank car quantities of high purity normal heptane which has been segregated from straight-run and natural gasolines by distillation has been announced by the

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chemical products department of Phillips Petroleum Co.

Preliminary examination of production stream samples indicate purity to be over 99 mol per cent. The traces of other hydrocarbons are considered to be chiefly 3-methylhexane or methylcyclohexane or both. The product was separated by superfractionation from the 16 naphthenes, isoheptanes, and other compounds boiling in the same range.

Group Named to Advise On Synthetic Program

WASHINGTON.—Eleven engineers and chemists have been named as a technical industry advisory committee to the $30,000,000 synthetic fuels program of the Bureau of Mines.

The group, said Dr. R. R. Sayers, Bureau of Mines director, will serve both to advise bureau scientists and to disseminate information on the work to industry which may ultimately develop the processes commercially. The 5-year program is devoted to study of the utilization of oil shale and the production of oil and gasoline from coal and lignite.

Members of the committee include Eugene Ayres, staff chemist, Gulf Research & Development Co.; H. W. Field, assistant manager, research and development department, Atlantic Refining Co.; H. O. Forrest, research director, M. W. Kellogg Co.; Dr. Louis S. Kassel, research engineer, Universal Oil Products Co.; P. C. Keith, president of Hydrocarbons Research, Inc.; L. C. Kemp, Jr., director of research, The Texas Co.; E. V. Murphree, vice president in charge of research and development, Standard Oil Development Co., and J. K. Roberts, research director, Standard Oil Co. of Indiana.

Humble Tops Refineries on Crude Charge Basis

What is the largest refinery in the United States?

Based purely on crude charging capacity—the standard method of expressing plant capacity—the distinction goes to the Baytown, Tex., refinery of Humble Oil & Refining Co.

The Baytown refinery was listed as having a 180,000-bbl. daily crude capacity in The Oil and Gas Journal's recent survey of refinery properties. The survey was based on information submitted by officials of the individual companies.

The Baytown plant's cracking capacity of 135,900 bbl. daily as shown in the survey is, however, exceeded by the refinery of The Texas Co. at Port Arthur, Tex. This plant has a crude capacity of 135,000 bbl. daily and a cracking capacity of 156,500 bbl. daily.

This method of comparison takes into consideration none of numerous other possible factors such as physical size, cost, or total production. From the crude and cracking capacity standpoint, some of the other largest refineries in the country are: Gulf Oil Co. at Port Arthur, crude, 167,200 bbl. daily, and cracking, 75,000 bbl. daily; Standard Oil Co. of New Jersey at Linden, 136,000 and 31,000 bbl.; Sun Oil Co. at Marcus Hook, Pa., 135,000 and 101,000 bbl.; Standard Oil Co. of Indiana at Whiting, 132,000 and 60,000 bbl.; Standard Oil Co. of Louisiana at Baton Rouge, 130,000 and 35,300 bbl.; Magnolia Petroleum Co. at Beaumont, Tex., 110,000 and 104,000 bbl.; Standard Oil Co. of California at El Segundo, 100,000 and 71,450 bbl.; and Union Oil Co. of California at Wilmington, 104,000 and 51,000 bbl.

Refinery Adds Fire Unit

ENID, Okla.—A fire-fighting department including a truck-mounted fog-producing unit, has been set up in Champlin Refining Co.'s plant here.

Lacy Asphalt Plant to Open

LAUREL, Miss.—A plant built by Roger Lacy, East Texas oil man and designed especially for the manufacture of asphalt from petroleum, is scheduled to begin operations near here April 15.

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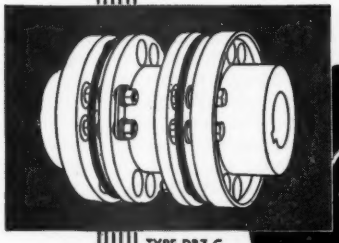

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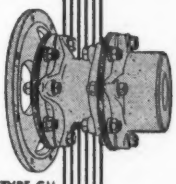

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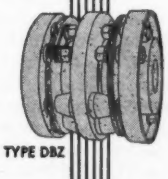

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PIPE LINES

Early Hearing Sought on Panhandle's 1946 Plans

WASHINGTON.—Another substantial improvement program for the country's natural gas distribution facilities was detailed here in a Federal Power Commission application by Panhandle Eastern Pipe Line Co. for approval of $27,313,000 worth of construction and additions to its system.

The 2-year program would enable Panhandle Eastern to deliver an additional 90,000,000 cu. ft. daily to the wholesale distributing companies and industrial customers it serves from lines which extend from the Hugoton field through Missouri, Illinois, Indiana, Ohio, and Michigan.

Panhandle Eastern asked the commission to set an early hearing on the program so that construction included in the 1946 part of the program can be completed before the period of heavy demand this winter. Planned for 1946 are a compressor station, 14 compressor units and 74 miles of line as follows:

A field compressor station near Sunray, Moore County, Texas, with a capacity of 3,000 hp. and including a dehydration plant.

Compressor units of 800-hp. capacity: three at the Hansford station in Hansford County, Texas; two at the Hugoton station in Stevens County, Kansas; and one at the Olpe station in Lyons County, Kansas; two 1,600-hp. units in each of the following stations: Glenarm in Sangamon County, Illinois; Tuscola in Douglas County, Illinois; Zionsville in Marion County, Indiana; and Edgerton in Allen County, Indiana.

Fifty miles of 18-in. trunk from Shamrock Oil & Gas Co.'s natural gas processing plant in Moore County, Texas, to the Hansford station, and 24 miles of 26-in. loop extending from the outlet side of the Tuscola station.

Construction planned for 1947 includes the following:

A field compressor station in Hansford County of 5,000-hp. capacity.

Seven 1,000-hp. capacity compressor units, one at the new station near Sunray and six at the Liberal station; three additional 800-hp. units in the Hugoton station.

About 292 miles of third loop line of 26-in. diameter paralleling existing loops; about 65 miles of 26-in. loop paralleling existing single lines; and 34 miles of 18-in. loop paralleling an existing line. River crossings of the new lines will be necessary over the Arkansas, Neosho, and Sangamon rivers. Valve and pipe changes also will be required at each compressor station on the main system.

Several months ago, Panhandle negotiated a contract with Shamrock Oil & Gas Co. under which Shamrock set aside for Panhandle's future needs a block of 57,000 acres of gas land in Sherman and Moore counties. The contract called for an initial minimum of 30,000,000 cu. ft. daily, increasing to double that amount in 10 years. First deliveries were scheduled for June 1.

Relaying of Little Big-Inch To West Coast Proposed

WASHINGTON.—The question of what to do with the big-inch pipe lines was given a new twist last week when L. M. Glasco, Dallas, proposed buying the little big-inch for relaying as an oil outlet to the West Coast.

In a letter to F. M. Berquist, vice president of the plant disposal division, War Assets Corp., Glasco, representing a group of independent Texas operators, said that the Government's 20-in. products line relaid from West Texas to California would contribute to national defense, bring economic benefits to the territories served, and provide small producers with an outlet for their crude.

The line, which extends 1,475 miles from the Texas Gulf Coast to the New York area and cost the Government $67,300,000, could be taken up and reinstalled with auxiliary equipment within 6 months, Glasco said he had been informed by construction companies. He pointed out the big-inch

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line would remain to guard against another oil emergency on the East Coast. There was no mention of monetary consideration.

Although the Reconstruction Finance Corp. recommended after an engineering survey that the lines be converted to natural gas, War Assets Corp., successor to the Surplus Property Administration, in a report to Congress favored use of the carriers for oil transport. Nothing was said about relaying either line. The SPA mailed a prospectus to 5,000 operators in the industry asking indications of interest in purchase or lease of the lines or in their use as common carriers.

Ector County Extension Considered by Stanolind

FORT WORTH.—A further extension of Stanolind Pipe Line Co.'s West Texas crude system south into Ector County is under consideration, Dr. Robert E. Wilson, chairman of the board of Standard Oil Co. (Indiana), the parent company, disclosed here during his recent tour of company properties.

Several weeks ago, Stanolind announced plans for a 35-mile, 16-in. addition to its present crude trunk line which runs from the Slaughter pool in Cochran and Hockley counties, Texas, to Drumright, Okla. This would extend the system to the Wasson pool in Gaines and Yoakum counties. Construction on this project is to start in May when pipe will be delivered. A further extension of the line into Ector County will give the company an outlet into an area where it has considerable production.

The contract for construction of the 35-mile line from Wasson station in Yoakum County to Slaughter station in Hockley County has been awarded to R. H. Fulton & Co., Lubbock, Tex.

Pasotex Planning New West Texas Crude Line

MIDLAND, Tex.—Pasotex Pipe Line Co. is making preliminary plans to lay a 108-mile, 8-in. crude line in West Texas from Wink to the Yates field in Pecos County.

The line would be an extension to Pasotex's present 195-mile, 8-in. carrier which takes West Texas crude to refineries in El Paso. The line also would tap the South Ward field in Ward County.

Pasotex is an affiliate of Standard Oil Co. of Texas which in turn is affiliated with Standard Oil Co. of California. The present Wink-El Paso line is reported to be moving 20,250 bbl. of oil daily, about 14,000 of which goes to Texas Standard's El Paso refinery and the remainder to the El Paso plants of The Texas Co. and McNutt Oil & Refining Co.

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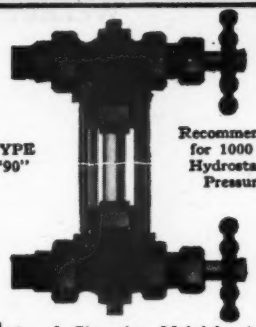
DROP FORGED STEEL
LIQUID LEVEL GAGES



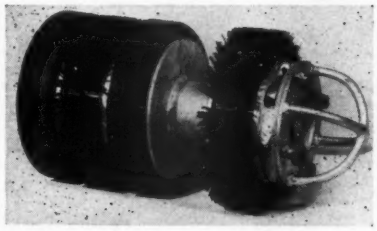
Made of Chromium-Molybdenuin alloy temperature resisting steel, extra heavy throughout and stainless steel trimmed. Positive automatic shut-off; stainless steel balls shut off the flow of liquid if glass breaks. Regrinding removable seats, heavy duty stuffing boxes, union connections. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

WRITE FOR LATEST INFORMATION

Jet-Rotation Pigs
CLEAN PIPELINES BETTER



Type RC Pipe Line Pig

- A proven scraper tool
- With Jet-Rotation feature*
- Revolves as it cleans
- Distributes wear of wire brushes and rubber cups

For crude oil, products, natural gas and water lines. Sizes 6-inch to 16-inch. Other types in sizes 2-inch to 26-inch.

*Patent pending.

THE PIG WITH THE POKE CLEANS PIPE LINES

T. D. WILLIAMSON, Inc.
TULSA, OKLAHOMA

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 6, 1946

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	32	16	0	*16	53,977	412	299	0	0	0	0	0	0	0	0	0	0
Pennsylvania	73	38	4	†31	122,803	1,084	924	0	0	0	0	0	0	0	0	0	0
West Virginia	14	3	9	2	48,526	184	198	0	0	0	0	0	0	0	0	0	0
Ohio	20	5	8	7	54,207	284	190	0	0	0	0	0	1	0	7	11	19
Indiana	4	3	0	1	6,724	72	43	0	0	0	0	0	1	0	0	6	7
Kentucky	8	5	0	3	14,073	110	93	0	0	0	0	0	1	0	0	14	15
Illinois	47	30	0	17	117,542	522	422	1	0	0	8	9	11	0	0	86	97
Michigan	12	4	1	7	24,931	167	191	0	0	0	3	3	3	0	0	58	61
Kansas	36	17	6	13	120,708	532	391	0	0	1	4	5	6	0	2	62	70
Neb., Mo., Iowa	1	1	0	0	2,287	5	12	0	0	0	0	0	0	0	0	2	2
Oklahoma	41	23	6	‡12	120,749	633	616	1	0	1	2	4	18	0	10	86	114
Texas	157	104	5	48	694,355	2,065	1,844	3	1	1	24	29	47	9	6	315	377
North Central	49	24	0	‡25	115,192	697	521	3	0	0	7	10	18	0	0	115	133
West	38	31	0	7	187,649	448	484	0	0	0	6	6	10	0	0	56	66
Panhandle	9	5	2	2	30,741	101	151	0	0	0	1	1	0	0	0	3	3
Eastern	7	6	0	1	33,097	193	78	0	0	0	1	1	4	0	1	29	34
Gulf Coast	43	33	3	7	280,770	484	439	0	1	1	5	7	11	7	3	68	89
Southwest	11	5	0	6	46,906	142	171	0	0	0	4	4	4	2	2	44	52
Louisiana	27	16	2	9	174,396	339	245	0	0	0	5	5	16	2	1	45	64
Northern	16	12	2	2	71,419	173	76	0	0	0	1	1	2	0	0	24	26
Southern	11	4	0	7	102,977	166	169	0	0	0	4	4	14	2	1	21	38
Arkansas	8	6	0	2	34,446	48	37	0	0	0	0	0	2	0	0	7	9
Mississippi	6	4	0	2	45,730	66	83	0	0	0	1	1	1	0	1	20	22
Southeastern states	0	0	0	0	0	12	8	0	0	0	0	0	0	0	0	11	11
Montana	2	2	0	0	6,431	62	73	0	0	0	0	0	2	0	0	3	5
Wyoming	0	0	0	0	0	47	56	0	0	0	0	0	5	0	2	17	24
Colorado	4	3	0	1	22,809	29	9	0	0	0	1	1	1	0	0	5	6
New Mexico	5	4	0	1	20,167	105	135	0	0	0	1	1	2	0	0	10	12
California	44	34	1	9	195,031	491	606	0	0	0	4	4	4	0	2	60	66
Utah	0	0	0	0	0	2	1	0	0	0	0	0	1	0	0	1	2
Total United States	541	318	42	181	1,879,892	7,271	6,476	5	1	3	53	62	122	11	31	819	983
Total previous week	549	294	56	199	1,978,460	6,730	5,975	15	3	0	16	94	117	10	28	766	921
Total April 7, 1945	500	289	54	157	1,732,417	6,476	5,009	9	0	3	52	64	163	4	37	821	1,025

Service wells included: *16, †29, ‡1.

MARKET QUOTATIONS

(Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gal. as of last Monday.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-80†	73-75
Mid-Continent*	6.00-6.25	5.25-5.50
Texas Gulf Coast	6.375	5.375-5.75
New York Area		7.425-7.90
California		6.00-6.875

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	2.750	3.300
N. Texas (f.o.b. plant)	2.250	2.700
N. Louisiana (f.o.b. plant)	2.625	3.150
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl.	
East Texas	$1.35
Conroe	1.53
Tepetate, Louisiana, avg. grav.	1.30
Illinois Basin	1.47
Pecos County, Texas	1.05
Bradford, Pennsylvania	3.10
Van, Van Zandt County, Texas	1.18

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$0.90	....	....	....
19-19.9	.94	....	$1.16	$0.80
20-20.9	.98	$0.95	1.18	.82
21-21.9	1.02	.97	1.20	.84
22-22.9	1.06	.99	1.22	.86
23-23.9	1.10	1.01	1.24	.88
24-24.9	1.13	1.03	1.26	.90
25-25.9	1.17	1.05	1.28	.92
26-26.9	1.21	1.07	1.30	.94
27-27.9	1.25	1.09	1.32	.96
28-28.9	1.28	1.11	1.34	.98
29-29.9	1.30	1.13	1.36	1.00
30-30.9	1.33	1.15	1.38	1.02
31-31.9	....	1.17	1.40	1.04
32-32.9	....	1.19	1.42	1.06
33-33.9	....	1.21	1.44	1.08
34-34.9	....	1.23	1.46	1.10
35-35.9	....	1.25	1.48	1.12
36-36.9	....	1.27	1.50	1.14
37-37.9	....	1.29	1.52	1.16
38-38.9	....	1.31	1.54	1.18
39-39.9	....	1.33	1.56	1.20
40 and above	....	1.35	1.58	1.22

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended March 30, 1946
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks—Gasoline	Stocks—Distillate	Stocks—Residual
East Coast	737	23,081	9,084	6,030
Appalachian	141	4,074	537	455
Ill., Ind., Ky.	747	24,150	3,222	3,019
Okla., Kan., Mo.	391	10,198	1,513	1,072
Inland Texas	229	3,134	311	654
Tex. Gulf Cst.	1,157	15,887	4,791	4,476
La. Gulf Cst.	336	4,562	1,339	1,004
N. La., Ark.	47	1,800	487	247
Rocky Mtn.	130	2,603	440	640
California	729	15,226	6,516	20,149
Total 3-30-46	4,684	104,715	28,240	37,746
Total 3-23-46	4,683	104,562	26,667	37,906
Total 3-31-45	4,653	97,602	26,682	41,111

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
March 23, 1946	225,153,000
March 16, 1946	226,233,000
March 24, 1945	221,227,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	April 6 crude oil	Bureau of Mines April demand	Mar. 30 crude oil
Alabama	1,150	700	950
Arkansas	77,450	78,000	77,050
California	855,300	834,000	855,250
Colorado	24,120	22,000	23,460
Eastern	65,850	61,900	63,650
Florida	100	100	100
Illinois	209,500	197,000	211,900
Indiana	19,150	14,000	18,400
Kansas	236,000	250,000	253,200
Kentucky	32,750	29,500	32,300
Louisiana	371,650	374,000	377,200
North Louisiana	84,850	.....	83,850
South Louisiana	286,800	.....	293,350
Michigan	46,370	46,000	46,920
Mississippi	55,850	53,000	57,000
Montana	23,460	21,000	23,440
Nebraska	750	800	750
New Mexico	95,300	99,000	95,150
Oklahoma	368,500	367,000	365,200
Texas	1,864,400	2,080,000	1,817,450
East Texas	327,200	.....	317,400
East Central Texas	130,500	.....	127,500
North Central Texas	149,000	.....	146,050
Texas Panhandle	82,000	.....	81,000
West Texas	450,000	.....	436,500
Southwest Texas	295,700	.....	290,200
Texas Gulf Coast	430,000	.....	418,800
Wyoming	95,990	92,000	98,000
Total United States	4,443,640	4,620,000	4,417,370
Change from prev. week, up	26,270		

Total production January 1-April 6 ..... 445,957,540 bbl.
Same period last year ..... 455,931,350 bbl.

CRUDE-OIL STOCKS 225,153,000 bbl. as of March 23—down 1,080,000 bbl. One year ago 221,227,000 bbl.

GASOLINE STOCKS 104,715,000 bbl. as of March 30—up 153,000 bbl. One year ago 97,602,000 bbl.

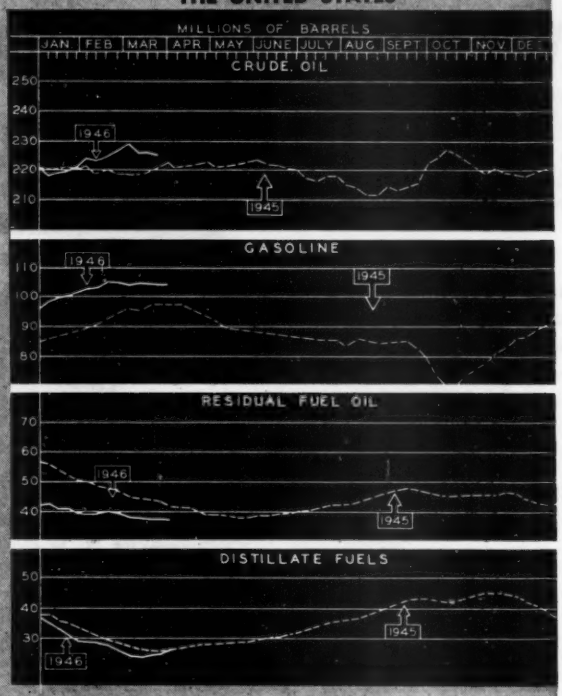
RESIDUAL FUEL-OIL STOCKS 37,746,000 bbl. as of March 30—down 160,000 bbl. One year ago 41,111,000 bbl.

GAS OIL AND DISTILLATE STOCKS 28,240,000 bbl. as of March 30—up 1,573,000 bbl. One year ago 26,682,000 bbl.

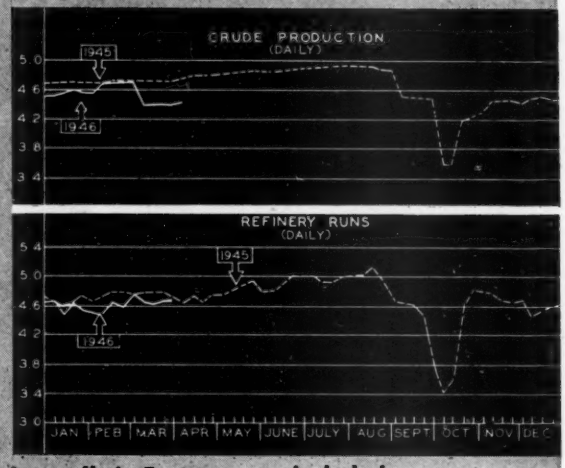
CRUDE-OIL PRODUCTION 4,443,640 bbl. as of April 6—up 26,270 bbl. One year ago 4,782,100 bbl.

REFINERY RUNS 4,684,000 bbl. daily week ended March 30—up 1,000 bbl. One year ago 4,653,000 bbl.

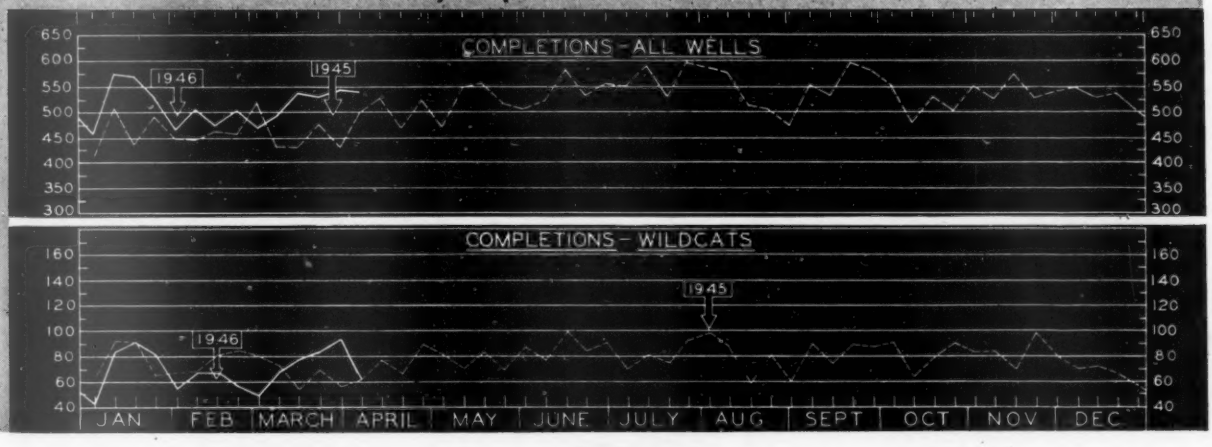
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included



NORRIS

WELL HEAD EQUIPMENT

Geared to YOUR Requirements

STUFFING BOXES

TYPE "C"

Of the same Norris High-Quality Workmanship throughout, the Bonnet is interchangeable with the Norris Type "S" Stuffing Box. Due to the fact the Norris Type "C" Stuffing Box does not use the compression spring, body is shorter than the Norris Type "S" Stuffing Box.

TYPE "S"

Norris Type "S" Stuffing Box is simple and compact, with parts interchangeable. Minimum overall height, convenient wrench grip. Extra long glands. Packing rings are of standard size with stronger, interchangeable spring allowing constant compression of packing. Norris High-Quality Workmanship throughout.

"T" TYPE

Norris FREE-WHEELING Stuffing Boxes meet the demand for low priced and economical units of advanced design Available in "T" Type, Regular and Flexible Types. Hand wheel permits packing take-up from any position. Large oil reservoir lubricates polished rod under pressure, NORRIS "S" and "C" Type Stuffing Boxes meet every requirement of Quality and low initial cost

BRADEN HEADS

Available in SWAGED TYPE with split glands, made of extra-heavy steel pipe, semi-steel glands and steel packing rings.

Norris Braden Heads are also available in Semi-Steel for 2,000 pound test pressure and Cast Steel for 4,000 pound test pressure.

SWAGED TYPE

TUBING SUPPORTS

Supplies the need for a stronger and safe means of supporting and packing the tubing strings. Extra long self-aligning slips won't cut or pinch tubing strings. Packing ring located at bottom of slips assures maximum tight seat without unnecessary parts or adjustments. Will fit any Standard or Berry Pattern Casing Head.

TUBING HEADS

The Norris Type "W" Full Opening Tubing Head fills a long felt need for a practical yet inexpensive tubing head. The tubing is supported by the collar resting on the gland. Weight of tubing, together with tightening of the bolts forces the rubber packing against tubing wall, thus shutting off pressure from within. Also available in Light and Regular Types and "S" Type Tubing Head.

"W" TYPE

FLOW BEAN

The Fully Adjustable Non-Chattering NORRIS Flow Bean is easily installed and serviced. Accurately Calibrated, Micrometer Type Dial, sychronized with needle, indicates Equivalent positive orifice size. Controls the flow of fluid or gas, also providing a means of regulating the pressure and rate of flow with extreme accuracy. 1,000-Pound Working Pressure type illustrated, also available for lighter service of 300-Pound Working Pressure.

SEND FOR
Descriptive Bulletin
NO 32
illustrates all NORRIS Well Head Equipment with complete specifications

EXPERIENCE BUILDING OIL TOOLS SINCE 1882

W.C. NORRIS MANUFACTURER, INC.

TULSA, OKLAHOMA

BRANCHES
HOUSTON, KILGORE, ODESSA, TEXAS. SALEM, ILLINOIS
503 CONTINENTAL BUILDING, DALLAS, TEXAS

EXPORT OFFICE
ROOM 1940, 30 ROCKEFELLER PLAZA
NEW YORK CITY

Exploration and Drilling

New Reserves Finding Rate

WITH the postwar reconversion period showing a sustained demand for petroleum products higher than anticipated, and the long-run picture of demand just as optimistic as ever, the question arises as to whether the finding rate for new oil reserves will keep pace.

One way to develop the answer to this question is to observe the present thinking of the exploration scientists, as compared with the way they were thinking 1 year ago, and 2 years ago. The best place to do this is at their annual meetings, when they get together and compare notes.

Two years ago, in the midst of war, heavy burdens had suddenly been laid on their war-depleted manpower resources. The general attitude was one of wistful hopefulness that the geophysicists would bring forth some new oil-finding tool, developed out of the research on war weapons. That hope was dashed when the geophysicists said that actually their normal rate of progress and improvement along existing instrumental lines had been retarded by the war.

One year ago, by the time of their meeting they knew from the proven-reserve figures that struggling along under handicaps, without any magic new tools, they had successfully weathered the first crisis. They were more hopeful, and confident, in a somewhat grim manner, that they could meet future tests from their own resources. They agreed with their retiring president that they had a powerful tool, if they would apply "controlled imagination" to their existing knowledge and techniques.

This year it is obvious from their conversation that a different mental attitude prevails. There is a note of buoyant optimism, an eagerness to attack new problems, and a confidence of success. Instead of waiting for some magic tool to be handed to them, there is a variety of ideas about new approaches. Research and the optimistic frame of mind that accompanies it is the dominant theme. All kinds of new ideas and new possibilities are being recognized and will be vigorously examined.

MICHIGAN

Michigan Operations Show Slight Increase

SAGINAW.—Michigan oil and gas operators completed a dozen tests and scheduled 11 new locations last week. Completions resulted in four oil wells, a small gas producer and seven dry holes, among which were three wildcat tests.

Sohio Petroleum Co. tapped its Durkee lease in Section 31 of Isabella County's Coldwater field for a producer with initial potential of 2,280 bbl. a day and in Adams-Arenac, Section 11, Don F. Rayburn checked production at 41 bbl. an hour after acidizing No. 3 State-Adams. Other producers were small wells in Algona of Kent County and Dorr of Allegan. The gas well is in Richfield, Roscommon County.

Oil and gas lease rights on 20,000 state-owned acres will be offered May 3 by the state conservation department, most of it in Ogemaw, St. Clair, Wexford, Iosco and Rosecommon counties.

MICHIGAN WILDCAT FAILURES

Barry County, Yankee Springs Township: Oil Producers, Inc. 1 R. & M. Bowerman, NE NW SE 1-3n-10w, dry in Monroe, TD 2,1[illegible] ft.

Kalamazoo County, Alamo Township: W. G. Gannett 1 Ford Meyers, NE NE NE 31-1s-12w, dry in Traverse lime, TD 1,306 ft.

Mecosta County, Deerfield Township: Michigan Consumers Gas Co. 1 Rogers-Crame, C SE 2-13n-9w, dry, TD 1,367 ft.

EASTERN TEXAS

Marion County Discovery Flows Gas and Distillate

DALLAS.—Magnolia Co. and Seaboard Oil Co. 1 Orr, Fowler Survey, discovery 2½ miles southwest of Avinger in northwestern Marion County, flowed 2,660,000 cu. ft. of gas, 126 bbl. of straw-colored distillate and 100 bbl. of water with a little drilling mud through a ½-in. choke in 13½ hours. Production is from the Cotton Valley through perforations from 9,025-35 ft. On volume test the discovery indicated production of 5,000,000 cu. ft. of gas with 250 bbl. of condensate daily.

A new wildcat for Cass County is W. B. Hinton 1 J. O. Betts. It is located on a 151.7-acre tract of the A. S. Beard Survey, 4 miles southeast of Marietta, and is to be drilled to 7,800 ft. W. S. York has staked a wildcat in Van Zandt County in the R. E. Kyle Survey, 2¼ miles northeast of Edom in Van Zandt County. It is contracted to 8,000 ft.

Hawkins field, Wood County, had four completions this week, and Pittsburg field, Camp County, and Merigale field, Wood County, each had one. Carthage field, Panola County, had three locations and Hawkins field had two. Carthage field has 24 drilling wells Hawkins field 22; New Hope field, Franklin County, 8; Sand Flat field, Smith County, 6; Waskom field, Harrison County, 5, and Talco field, Franklin County, and Pickton field, Hopkins County, each have 4.

EASTERN TEXAS WILDCAT FAILURE

Hill County: A. R. Lewis (F. M. Crockett) 1 R. L. Cartwright, E. Hart Sur., 1 mi. NW Hoehn, Austin 276 ft., dry, TD 890 ft.

SOUTHWEST TEXAS

Production Test to Be Made At Bee County Wildcat

CORPUS CHRISTI.—A prospective pool opener, Bridwell Oil Co. 1 Sliva Estate, wildcat test 9 miles southwest of Beeville, in Bee County, has set 5½-in. casing for production test. A 20-minute drill-stem test in the Stillwell sand at 4,377-87 ft. recovered 210 ft. of oil and a little mud, with 60 lb. working pressure, through ¼-in. chokes. This test is approximately 4½ miles southwest of the Yougeen field gas production and 3½ miles northwest of Tynan field.

Blanco Oil Co. and Al Buchanan 5 A. M. Bruni Estate, opened a new sand in North Albercas field, Webb County. On a 45-minute drill-stem test at 2,520-24 ft. the well developed 98 lb. flowing gas pressure and recovered 15 ft. of gas-cut mud. Operators are preparing to set casing to complete as a gas well in the Pettus at 2,520-24 ft. The regular field pay comes in just below 2,310 ft. A test at 2,525-34 ft. recovered salt water.

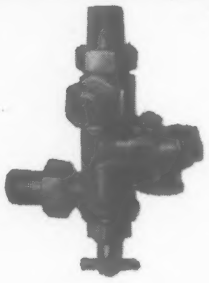
Also in Webb County, Blanco & Buchanan 2 Marrs McLean, a new wildcat in the North Albercas area, is waiting on rig.

Two new wildcats were announced for northeastern Victoria County this week. J. B. Ferguson and P. W. Michaux et al will drill their 1 E. B. Fuhrman as a 5,000-ft. wildcat test about 3 miles southwest of Inez and about 3 miles north of the East Telferner field in Valentin Garcia Grant, near the Jackson County line. Approximately 2⅝ miles southeast of the Keeran field and about 3½ miles southwest of West Ranch field, Barnsdall Oil Co. will drill 10 Union Keeran as a 7,200-ft. wildcat test on a 5,000-acre lease, 14,100 ft. southeast of the nearest producer at Keeran, in Marther de Leon Survey, 10 miles south of Inez.

A new deep test has been staked by Phillips Petroleum Co. The 1 Roloff, a 10,000-ft. wildcat test, 10 miles northeast of San Benito, Cameron County, is located in Lots 73 and 74, Arroyo Gardens share 12.

Of the 36 new locations reported this week 12 are wildcats, 2 in Victoria, and 1 each in Bee, Cameron, Karnes, Live Oak, McMullen, Refugio, Starr, Travis, Val

PENBERTHY
AUTOMATIC
INJECTORS



The accepted method for assuring an uninterrupted supply of feed water to oil field boilers. Penberthy Automatic Injectors will supply feed water to boilers at minimum cost, are quickly and easily installed, reliable under most severe operating conditions, require little attention and no careful handling. Highest quality design and rugged construction.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

Consistently GOOD!

Seven years of preventing leaks on threaded, gasketed, and coupled connections for the Oil Industry has proved the uniform high quality of RECTORSEAL. The plastic elastic mass seals quickly . . . will not freeze and holds indefinitely. Use directly from can without mixing. Apply with brush or swab. Have you tried RECTORSEAL recently? Ask for it by name at your regular supply store.

RECTOR WELL EQUIPMENT COMPANY, Inc.
Fort Worth, Texas

Export: Lucey Export Corp., Woolworth Bldg., N. Y. C.

RECTORSEAL
THE POSITIVE LEAK PREVENTER

Verde, and Webb counties. Agua Dulce field in Nueces County received six new locations. There were 35 completions with 5 being dry wildcats, 2 in Webb, and 1 each in Lee, Nueces, and Zapata counties.

WILDCAT FAILURES IN SOUTHWEST TEXAS

Lee County: Humble 1 Geo. Vick et al, in Tanglewood area, Bethel Smith Survey, dry, TD 8,855 ft.

Nueces County: Mosser, Anderson & Kirkwood 1 H. V. Fuchs, in F. Z. Bishop Subdivision of Palo Alto Grant, Sec. 178, 4 mi. NW of Bishop, dry, TD 8,015 ft.

Webb County: Texas Co. 1 M. B. de Spain, CCSD&RGNG Survey 12, dry, TD 2,113 ft.

Texas Co. 1 Griffin Watkins Est., San Casimiro Y De Las Fuentes Survey, Abst. 1208, 16 mi. NW of Freer, dry, TD 1,405 ft.

Zapata County: Harvey Mecon 1 Calixto Gutierrez et al, Porcion 1, approximately 5 mi. NE of Zapata, dry, TD 2,508 ft.

SOUTH LOUISIANA

Deep Gas-Condensate Sand Opened in Branch Field

NEW ORLEANS.—A new deep sand has been opened to gas and condensate production at Branch field in Acadia Parish. Union Sulphur Co., Inc. 1 Brunner-Bonnin, 60-8s-2e, drilled to a total depth of 11,919 ft., gaged 4,300,000 cu. ft. of gas and a considerable amount of condensate through a 10/64-in. choke. The condensate was not gaged. Tubing pressure was 5,000 lb. while flowing and 6,500 lb. shut in. The 7⅝-in. casing is set at 10,913 ft. with 5-in. liner down to 11,869 ft. Production is through 53 perforations at 11,808-821 ft. The 2½-in. tubing is set at 11,796 ft.

At Mud Lake field in Cameron Parish, Magnolia Petroleum Co. 1-B Lutcher, second test for this field, opened a new sand. On initial test flowed 21 bbl. of condensate along with 27 bbl. of salt water and 1,234,000 cu. ft. of gas through a 12/64-in. choke. Tubing pressure 3,400 lb. flowing. Hole was then plugged back and perforated with 48 shots from 9,640-50 ft. for a flow of 31 bbl. of condensate, 48° gravity, and 2,983,000 cu. ft. of gas through a 12/64-in. choke, tubing pressure 3,400 lb. flowing. This well is 800 ft. north of the 1-A discovery well, in 33-14s-11w. The discovery well was completed through two sets of perforations, 10,617-648 ft. and 10,652-660 ft. The field was discovered in October 1945.

In the East Moss Lake field area of Calcasieu Parish, Continental Oil Co. 1-B Prairie Canal Co., Inc., 3-11s-9w, has found formations with oil odor and some saturation at a new higher level. Sand and shale with oil odor was cored from 9,991-10,011 ft., and sand with oil odor and some saturation from 10,011-31 ft. Operators are pulling core from 10,031-047 ft.

There were eight new locations reported this week, one being a wildcat in St. Bernard Parish. Four producers were completed, one each in Bon Air field, Jefferson Davis Parish St. Martinville field, St. Martin Parish; Bay St. Elaine field, and Lirette field in Terrebonne Parish. Of the seven dry holes four were wildcats, one each in Cameron, East Baton Rouge, Evangeline, and Vermilion parishes.

SOUTH LOUISIANA WILDCAT FAILURES

Cameron Parish: Sohio Pet. Co. 1 Matilda Gray, 12-15s-14w, Smith Ridge, dry, TD 12,448 ft.

East Baton Rouge Parish: Sugarfield Oil Co., Inc. 1 Jones Estate, 44-6s-1e, dry, TD 9,451 ft.

Evangeline Parish: R. W. O'Meara 1 Price et al, 53-3s-2e, dry, TD 10,512 ft.

Vermilion Parish: Phillips Pet. Co. 1 Bouillion, 29-12s-2e, dry, TD 1,154 ft.

TEXAS GULF COAST

New Producing Zone Found in Aldine Field

HOUSTON.—A new sand has been opened in the Aldine field of Harris County by F. M. Corzelius 1 O. P. Hairgrove, E. Farias Survey, Abstract 278. Drilled to 7,542 ft., this well came in for gas-condensate production through perforations from 7,528-540 ft., tubing pressure 2,250 lb., and casing pressure 2,225 lb. Top of sand was 7,527 ft.

H. M. Harrell 1 Zapp Unit, Joseph Farwell Survey, west outpost to the Bammel pool of Harris County, has been completed for 2,379,000 cu. ft. of gas daily through a ¼-in. choke with 1,455 lb. flowing pressure on tubing and 1,512 lb. shut-in pressure. Production is through perforations at 6,217-6,225 ft.

Humble Oil & Refining Co. 1-B Mettler et al, J. W. Cloud Survey, north of Angleton field production in Brazoria County, has been completed for a gage of 1,000,000 cu. ft. of gas daily through a ¼-in. choke with 1,300 lb. flowing pressure and 2,300 lb. shut-in pressure on the tubing. Flow is through 100 perforations at 10,416-436 ft.

Potential discovery well for a new oil field in Newton County, Humble 1 W. W. Moore, Jr., 2½ miles southwest of Bon Wier townsite, in the A. D. Stark Survey, is preparing to run production test through 15 perforations at 10,365-70 ft. and 30 perforations at 10,370-10,375 ft. On a previous test through perforations with 60 shots from 10,365-375 ft., the well swabbed only water with a slight show of gas.

One wildcat test, Dick Schwab 1 O. H. Caldwell, was reported this week, located in A. G. Holland Survey, 2½ miles east of Fairbanks townsite. Wharton County received four new locations to take the lead this week, with Chambers, Hardin, Harris each receiving two new locations. Jefferson, Liberty, Matagorda, Polk, and San Jacinto each received one location. Two new gas-condensate sands were opened, one each in Brazoria County and Wharton County. Chambers County received four completions, and Brazoria, Harris, Jefferson and Wharton received two each.

UPPER GULF COAST SUCCESSFUL WILDCATS

Brazoria County: New gas sand in Blue Lake field—McCarthy Oil & Gas Corp. 2 Frank K. Stevens et al, Geo. Robinson League, Abst. 126. Dual completion: TD 10,600 ft., new sand perf. 36 holes 9,028-40 ft., PT 4,510,000 cu. ft. gas per day through ¼-in. choke, open 27,500,000 cu. ft. gas per day, TP 2,810 lb., shut-in TP 3,220 lb., no water, perforations 24 holes 8,915-23 ft., PT 3,096,000 cu. ft. gas per day through ¼-in. choke, open 31,500,000 cu. ft. gas per day, CP 3,070 lb., shut-in CP 3,175 lb., no water.

Wharton County: Two new gas-condensate sands in Daboval field—Floyd L. Karsten 1 Gus Lilie, ETRR Co. Sur. 73, Abst. 130: Dual completion: TD 7,404 ft. "C" sand completion: top sand 7,226 ft., perf. 18 holes 7,230-34 ft., PT 1,740,000 cu. ft. gas per day through 8/64-in. choke, open flow 23,500,000 cu. ft., CP 2,485 lb., no gravity, trace water. "T" sand completion; top sand 7,126 ft., perf. 16 holes, 7,140-44 ft., PT 53 bbl. condensate 24 hours through ⅛-in. choke, gas-oil ratio 11,255 to 1, gravity 42°, no water.

UPPER GULF COAST WILDCAT FAILURES

Chambers County: McCarthy Oil & Gas

Corp. 2 E. A. Wilborn et al, Andrew Weaver Sur., Abst. 311, dry, TD 7,055 ft.

Windsor Oil Co. 1 E. W. Boyt, T&NO Sur., Sec. 25, in Double Gum area, dry, TD 5,516 ft.

Harris County: Jack W. Frazier 1 Kalb & Dumas, P. J. Duncan Survey, dry, TD 7,780 ft.

Hinkle Drilling Co. 1 Mrs. Minnie H. Allen, in Addicks area, in Blas Herrera Survey, dry, TD 8,223 ft.

PERMIAN BASIN

Ector County Test Recovers Oil From Ellenburger

MIDLAND.—Phillips Petroleum Co. 1 Edison-Scharbauer Estate, Section 25, Block B-15, Public School Land, Ellenburger discovery in southern Ector County, ¾ mile northeast of Judkins, on a 90-minute drill-stem test from 8,945-70 ft. recovered 4,320 ft. of oil and 240 ft. of mud cut with oil, gas and water. On a later 90-minute drill-stem test from 8,940-8,995 ft. gas came to the surface in 43 minutes. Recovery was 6,800 ft. of clean oil and 1,450 ft. of salty sulfur water. It was deepened to 9,020 ft. and preparations were being made for another drill-stem test. The well is Ector County's second Ellenburger pool opener. It is ¾ mile west of the north end of the Penwell area which produces from the San Andres.

Argo Oil Corp. 1 Dora Roberts, Section 294, Block 13, H&GN Survey, wildcat 13 miles northeast of Balmorhea, Reeves County, took an 8-hour drill-stem test from 10,077-142 ft. There was gas in 1½ hours, estimated at 50,000 cu. ft. daily. Recovery was 600 ft. of gas and oil-cut mud. Operator was coring ahead.

Stanolind Oil & Gas Co. 1 Mack Taylor, Section 8, Block B-2, Public School Land, is the first well to be completed in the Devonian in the Keystone field of Winkler County. It is 1 mile east of Ellenburger production in the pool. It flowed 351 bbl. of oil in 24 hours through 12/64-in. choke. Production is from 8,040-8,135 ft. It tested sulfur water in the Ellenburger.

Welch field, Dawson County, had five completions this week and Fullerton field, Andrews County; Slaughter field, Cochran and Hockley counties; Garza field, Garza County; Pecos Valley High Gravity field, Pecos County, and Todd Deep field, Crockett County, each had three. Fullerton field had four locations and Garza field had five. TXL field, Ector County, has 34 drilling wells, Keystone - Ellenburger field, Winkler County, 31; Block 31, Crane County, 23; Fullerton field, 20, and Welch field, 10.

WEST TEXAS WILDCAT FAILURES

Crockett County: Ledge Petroleum Co. 1 L. Bouscaren, Sec. 29, Blk. GG, HE&WT Sur., Clear Fork test in Noelke pool, elev. 2,883 ft., Clear Fork 3,972 ft., dry, TD 4,298 ft.

Ector County: Texas 29 W. E. Connell, Sec. 9, Blk. B-16, PSL Sur., 2 mi. W Penwell pool, elev. 2,877 ft., Simpson 8,440 ft., McKee 8,885 ft., Ellenburger 9,525 ft., dry, TD 9,675 ft.

Midland County: Magnolia 1 Roy Parks, Sec. 10, M. Daugherty Sur., 11 mi. SW Midland, elev. 2,840 ft., San Andres 4,695 ft., dry, TD 5,914 ft.

Pecos County: Phillips 1 Elsinore Cattle Co., Sec. 53, Blk. D, GC&SF Sur., 19 mi. S Ft. Stockton, elev. 4,105 ft., dry in Pennsylvanian, TD 12,096 ft.

Standard of Texas 1 J. H. Tippett, Sec. 46, Blk. 194, GC&SF Sur., 2¼ mi. W of Tobarg pool, San Andres 1,503 ft., dry, TD 2,413 ft.

Ward County: Continental 1 F. H. Scott, Sec. 33, Blk. 33, H&TC Sur., 3½ mi.

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SW Barstow, elev. 2,548 ft., Delaware 4,812 ft., dry, TD 4,920 ft.

PANHANDLE WILDCAT FAILURE

Collingsworth County: Humble 1 Scruggs, Sec. 58, Blk. 19, H&GN Sur., 10 mi. SW Wellington, dry, TD 5,988 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Humble Oil & Refining Co. 1-B Hardison, 34-21s-37e, 1½ miles north of the nearest producer from the Yeso in the Paddock field, Lea County, will be completed in the Yeso zone of the Clear Fork section of the Permian lime after flowing from two zones at a combined rate of 28 bbl. hourly. The well tested 17 bbl. of oil hourly from 6,500-60 ft. through 5½-in. casing and 11 bbl. an hour from perforations from 6,420-80 ft. One thousand gal. of acid had been injected into the two zones. The test is 2½ miles north and slightly west of the nearest producer from the Drinkard pay.

Continental Oil Co. 4-B-23 Skaggs, 23-20s-37e, outpost to Pennsylvanian production in the Skaggs field in eastern Lea County, flowed 22 bbl. of oil daily on gas lift. Plugged back depth is 7,585 ft. It flowed 177 bbl. of oil in 6 hours then died after being treated with 4,000 gal. of acid. The oil was cut 16 per cent by acid water. The test was being swabbed in an effort to make it kick off.

Square Lake field, Eddy County, West Roberts field, Drinkard field and Penrose-Skelly field, Lea County, each had one completion. Anderson and Grayburg-Jackson fields, Eddy County, and Young, Drinkard and Eaves fields, Lea County, each had one location. Grayburg-Jackson field has seven drilling wells; Penrose-Skelly and Paddock fields, Lea County, and Empire field, Eddy County, five, and Drinkard field, Lea County, four.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

DeBaca County: Francois et al 1 Marshall, 7-3n-26e, N Ft. Sumner, dry in San Andres, TD 605 ft.

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ROCKY MOUNTAIN

New Pool on Southern Rim of Big Horn Basin

DENVER.—A new pool on the southern rim of the Big Horn Basin, in Hot Springs County, Wyoming, has been opened in Continental Oil Co. 1 Vannoy, NE SW NE 3-43n-93w, in the Embar formation topped at 4,100 ft. and drilled to 4,133 ft. A drill-stem test, with packer set at 4,090 ft., open 30 minutes, resulted in a recovery of 2,090 ft. of oil and 200 ft. of mud. The crude is typical Embar black oil, but no gravity test had been run at last reports. The discovery well is located only 2½ miles west of Pacific Western Oil Corp. 1 State, a discovery in the Embar last October on the Zimmerman Butte structure. The Continental well, on the Corley dome, is mapped, however, as a separate structure. The new field lies 12 miles northeast of the town of Thermopolis, and approximately the same distance east and a little south of the Gebo field which was discovered by Continental in 1943. It is unitized with 2,040 acres within the unit, all controlled by Continental with Kennecott Copper Co. holding an interest. The Embar was picked up much higher than was expected, and was topped at approximately 358 ft. above sea level, or 142 ft. higher than in the Zimmerman Butte discovery. The latter had the top of the Embar at 4,313 ft., or 218 ft. sea level datum. It pumped an average of 11 bbl. per hour on a 24-hour test. Pacific Western has spudded in its 75 Hilliar-Government, SW SE SE 35-44n-93w, ¼ mile southwest of the Zimmerman Butte discovery. The Continental discovery will be completed in the Embar and another well will be drilled to the Tensleep.

River Dome operation.—Pure Oil Co. 1 Unit, NE NE NW 18-48n-92w, River Dome, Washakie County, Wyoming, a basinward structure in the Big Horn Basin, is being completed in the Embar through perforations in the 7-in. at 9,990-10,055 ft. as a discovery. It will be acidized before testing. In the meantime it flowed natural at the rate of 144 bbl. per day on a 12-hour test, the oil going over the top from a depth of nearly two miles.

Garland field gas cap.—The oil ring around the gas cap in the Garland field, Big Horn Basin, Wyo., may be higher up on structure than heretofore believed as a result of showing in Ohio Oil Co. 14 Kinney-Coast-Ohio Unit, SW NE SE 30-56n-97w. Total depth is 4,205 ft., top of Tensleep 4,112 ft. Drill-stem test with packer at 4,118 ft., open 1 hour, resulted in recovery of 360 ft. of oil and gas-cut mud, 1,100 ft. of oil and 590 ft. of mud. Sea level datum of Tensleep top is 65 ft. Wells heretofore drilled to the Tensleep for oil have had the top at —5 to —265 ft., the latter being for General Petroleum 1 Howell, the discovery. Operators have avoided shooting for the Tensleep when geology indicated it would be topped above sea level in order to avoid the gas.

Wildcat near Denver.—F. G. West (for-

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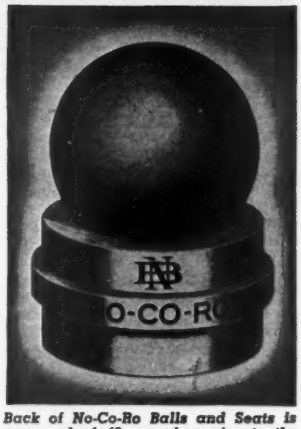

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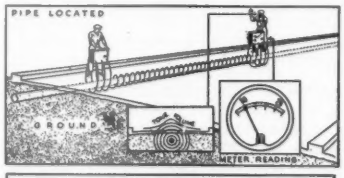

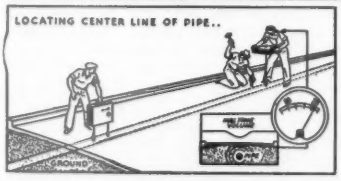

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merly carried as West & Wilson) 1 Zang, Jefferson County, Colorado, has resumed drilling and is making hole below 2,550 ft., several hundred feet in the Hygiene formation. Some shows of oil have been reported.

New operations.—Eleven new operations were reported, all development wells. Of these one was in the Rangely field, Colorado; one in North Baxter Basin, Wyoming; and four in Kevin-Sunburst, two in Cat Creek, two in Pondera, and one in Cut Bank in Montana. The most interesting of these is Transcal Petroleum Corp.-Cameron 3 Union Pacific, NE SE NW 11-19n-104w, which is ½ mile west of the two Nugget sand producers completed by these interests. It will go to the Nugget sand.

Completions.—Completions were down to six wells, of which five were oil wells with initial production of 1,065 bbl., and one was a dry hole. Four of the completions were in Colorado, of which 3 oil wells for 832 bbl. were in the Rangely field and the dry hole was a wildcat. Wyoming had no completions. Two in Montana were oil wells in the Cut Bank field for 233 bbl. initial.

COLORADO WILDCAT FAILURE

Turkey Creek, El Paso County: Colorado Petroleum, Inc. 1 Hart, C SW SE 17-17s-67w, TD 3,498 ft. in lower Pennsylvanian, plugged back and tested small shows at 2,612, 2,885 and 3,300 ft. without results.

APPALACHIAN FIELD

Large Gas Well Finaled In Kanawha County

PITTSBURGH.—In Elk district, Kanawha County, West Virginia, A. C. Radford et al completed a test on Daniel Robertson farm with a final open flow of 11,400,000 cu. ft. of gas after shot. The surface elevation was 1,153 ft., Corniferous lime 5,340 ft. and Oriskany 5,445 ft. Gas was found at 5,458-69 ft. and the well was shot at 5,456-76 ft. Rock pressure was 1,560 lb. in 18 hours.

In Baileysville district, Wyoming County, United Producing Co. completed the largest of the Berea wells in the area in 1,242 W. M. Ritter Lumber Co. with a final gage of 5,367,000 cu. ft. gas, natural. The surface elevation is 1,633 ft., Big Lime 2,475 ft., Injun 3,402 ft., Berea 3,637 ft., gas 3,656-68 ft., total depth 3,671 ft.

In Otter district, Braxton County, the important Oriskany wildcat of Hope Natural Gas Co. on Ed L. Boggs farm failed to get production in the Oriskany sand where salt water intruded and filled up the hole 2,000 ft. The surface elevation is 1,055 ft., Corniferous Lime 6,105 ft., Oriskany 6,277 ft., and water 6,278-6,300 ft.

During the week eight new locations were announced in Union district, Barbour County; Washington district, Boone County; Center and Sheridan districts, Calhoun County; Buffalo district, Clay County; Falls district, Fayette County; Washington district, Jackson County.

In Fairfield Township, Westmoreland County, southwest Pennsylvania, Peoples Natural Gas Co. topped the Oriskany sand at 7,230 ft. in the wildcat on Camilla Giffin farm and at 7,303 ft., there has been no showing of gas, oil or water with the sand appearing of poor quality and heavily calcited. At 7,286 ft. the samples still showed sand. The top of the Oriskany is 5,583 ft. below sea level with the Onondaga chert section 157 ft.

During the week five new locations were made in Kiskiminitas and Red Bank townships, Armstrong County; Porter Township, Clarion County; Washington Township, Greene County; Bell Township, Westmoreland County.

N. CENTRAL TEXAS

Oil Shows Encountered in Test Southeast of Crowell

WICHITA FALLS.—Magnolia Petroleum Co. 1 Rosannah Steele, Section 307, Block A, H&TC Survey, wildcat 7 miles southeast of Crowell, Foard County, drilled soft conglomerate showing oil from 5,326-30 ft. Casing was perforated with 51 shots from 5,322-32 ft. It tested 4 gal. of oil, natural. It was treated with 1,000 gal. of acid and recovered small amount of oil and acid water. Spudder was being moved in to test.

Denver Producing & Refining Co. 1 Jewell, Section 15, Wm. Allen Survey, wildcat 6 miles southeast of Gordonville, Grayson County, perforated from 8,580-8,640 ft. and swabbed mud, water and oil. Tubing stuck and operator was still fishing. Total depth was 9,413 ft. and it was plugged back to 8,717 ft.

National Associated Petroleum Co. will drill a 5,000-ft. wildcat 3 miles southwest of Vernon in Wilbarger County. It is 1 Well, 330 ft. from the north and west lines of the northeast quarter of Block 111, H&TC Survey.

Electra field, Wichita County, had seven completions this week, Gatewood field, Cooke County, and Holliday field, Archer County, two each Electra field had four locations, KMA field, Wichita County, and Wilson field, Cooke County, each three, and Holliday field, Gatewood field, Hildreth and Nocona fields, Montague County, two each. Knox field, Young County, and Sivells Bend field, Cooke County, each have seven drilling wells, Cooper field, Archer County, and National field, Wilbarger County, each five, and Hildreth field and Lupton field, Young County, each four.

In West Central Texas Jones County Regular field and Cooper field, Jones County, each had two completions this week. Cooper field had two locations and Reddin field, Taylor County, and Lewis Steffins and Stith fields, Jones County, each had one. Stephens County Regular field has five drilling wells, Reddin field three. Eastland County Regular field, Loving field, Stephens County, and Palo Pinto Regular field each had two.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCATS

Clay County: New oil pay—L. T. Burns 1 Ford, Sec. 3221, TE&L Sur., ¾ mi. NE discovery well Heard pool, elev. 1,121 ft., flowed 560 bbl. day through ½-in. choke on 2-in. tubing, perf. 5,750-60 ft. Caddo, failed in Ellenburger topped at 6,540 ft., gravity 40°, TD 6,701 ft.

Montague County: New oil pool—Youngblood & Foree 2 Joe Benton, A. A. Lewis Sur. A-420, 3 mi. N and 1½ mi. W Stoneburg, elev. 915 ft., flowed 3,172 bbl. day through ¾-in. choke, perf. 6,132-42 ft. Caddo, gravity 43°, gas-oil ratio 1,500 to 1, TD 6,243 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: Bridwell Oil Co. 2 E. A. Debus, Sec. 2, SPRR Sur. A-1202, 2½ mi. W Holliday, dry, TD 1,901 ft.

Gorman, Hedrick & Johnson 1 Geo. Parrish, Lot 1, Blk. 97, ATNCL Sur., 9 mi. S and 1½ mi. W Holliday, dry, TD 1,613 ft.

Clay County: Panhandle Refg. 1 Lorine Segler, W. A. Farris Sur. A-146, 2 mi. S and ¼ mi. E Joy, elev. 1,079 ft., Ellenburger 6,453 ft., dry, TD 6,516 ft.

Jack County: Hanlon-Buchanan et al 2 Mrs. M. L. Knox, Sec. 2, SPRR Sur. A-2202, 3 mi. E and 4 mi. S Antelope, dry, TD 630 ft.

Hanlon-Buchanan et al 2 Mrs. M. E. Mun-

son, Sec. 1, TCRR, Sur. A-2046, 6½ mi. E and 3 mi. S Antelope, dry, TD 603 ft.

Young County: B. C. Gilmore 1 E. W. Oatman, Sec. 1936, TE&L Sur., ¼ mi. SW Loving, elev. 1,179 ft., dry, TD 786 ft.

WEST CENTRAL TEXAS SUCCESSFUL WILDCAT

Shackelford County: New oil pool—Allied Oil Co. 1 L. A. Sanders, Sec. 583, TE&L Sur., 3 mi. NE Albany, elev. 1,355 ft., flowed 443 bbl. day through open 2-in tubing, perf. 4,538-39 ft. Ellenburger, gravity 42.6°, gas-oil ratio 600 to 1, TD 4,540 ft.

WEST CENTRAL TEXAS WILDCAT FAILURE

Jones County: West & Honea et al 1 Owens, Sec. 3, BBB&C Sur., 1½ mi. E Stanford, elev. 1,580 ft., Palo Pinto 3,515 ft., dry, TD 3,518 ft.

CALIFORNIA

Los Angeles Basin Wells To Be Tested Soon

LOS ANGELES.—Two important wildcats in Los Angeles Basin are being prepared for early production tests and the outcome of work on one may be determined within the next several days. The other, Ohio's second test at Gardena, has been delayed due to a fishing job and the projected test may not be made for another week. The well scheduled for an immediate test is the outpost of Chanslor Canfield Midway Oil Co. south of production in the East Los Angeles field which was carried down to 10,058 ft. and 9⅝-in. casing cemented at 9,938 ft. Because no data is being released on the Bandini test of C.C.M.O. Co. it is not definitely known how much oil sand has been found but the company would not land casing unless indications pointed to possible production or offered some tangible evidence to justify the cost.

Ohio Oil Co. should know shortly whether it has moved in the right direction at Gardena where the company found unusual indications of the existence of a new field last year. The company was unable to complete the initial test because of inability to effectively shut off what was probably formation water. The second test at Gardena is located northwest of the first hole and it has just reached the critical depth. Ohio has been unable to make a satisfactory formation test in 2 Gardena Community and for this reason does not definitely know how good the oil sand is in the second hole. Three tests were unsuccessful due to packer failures. This well is down 10,067 ft. and is temporarily delayed with a fishing job that should be quickly solved. On the basis of the favorable showing of Ohio's initial wildcat in this area, the company should open up a new field if the second hole is more favorably located structurally. In the upper part of the hole the second wildcat appeared to be running about 150 ft. higher than the original test.

Independent Exploration Co. completed its second excellent flowing well in the west Sheep Springs field of Kern County and appears to have found an excellent accumulation. This new well was 3 Temblor, completed in the Carneros sand at 2,760-2,826 ft. flowing 600 bbl. per day through a small bean. If the 17/64-in. bean had been increased to 32/64-in. or larger, the well's initial would have greatly exceeded 1,000 bbl. per day. This new well is southeast of the deep sand discovery well and is higher structurally. The future importance of this area from a production standpoint remains to be determined although on the

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basis of the first two completions there can be no question as to the productivity of the sand.

New locations staked or mapped during the week were about on a par with completions indicating a balance between new work and old work. A similar condition has prevailed for several weeks past and there is no reason to anticipate any great change in the immediate future. A large part of drilling in the state at present is located in the San Joaquin Valley and for this reason completions and new locations are situated in that area. Cymric, Edison, Paloma, Jacalitos, Elk Hills and other fields in the Valley show a sustained amount of new work that will probably continue for the rest of the year. In Los Angeles Basin, drilling operations have been at a much slower rate but recent discoveries of new fields and possible new discoveries not yet proved up may stimulate drilling later in the year.

CALIFORNIA WILDCAT FAILURES

Kern County, Bakersfield: Hancock 1 Kaar, 26-29s-28e, bottomed in gray Jewett sand, only minor showings, TD 7,009 ft.

San Emidio: Standard 37-24 Kern County Land, 19-11n-22w, bottomed in gray sand, brown shale 3,750 ft., form. test 3,200-3,310 ft. recovered 180 ft. watery mud, no oil or gas, TD 5,152 ft.

Orange County, Yorba Linda: Scoggins & Long 1-T Yorba, 24-3s-9w, bottomed in gray sand, no important showings, converted to water well, TD 3,010 ft.

Solano County, Rio Vista: Standard 5 Cal. Packing Corp., 24-5n-2e, bottomed in barren gray sand, top Markley sand 3,665 ft., top Domengine 5,463 ft., top Capay sand 5,580 ft., TD 7,020 ft.

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ILLINOIS

Calhoun Pool Extended By Heavy Producer

MATTOON.—Pure Oil Co. 1 A. H. Howard, NE NE SE 13-2n-9e, Richland County, was completed during the past week as one of the largest oil wells in Illinois in several weeks. It flowed 1,305 bbl. of oil a day from the McClosky at 3,147-54 ft., total depth 3,170 ft., following an acid treatment of 5,000 gal. This well extends the Calhoun pool about ½ mile to the southwest.

Drilling in Illinois, which usually shows a seasonal decrease in March, continued an upward trend to record the largest number of completions that has been reported for any month of March since 1941, according to the monthly report of the Illinois State Geological Survey. Emphasis during the month was on development of pools, with an unusually small number of wildcat wells being drilled. No new pool was discovered, and only one extension well was reported, to the Cisne pool in Wayne County. The total number of wells completed increased from 135 in February to 157 in March, with the number of producers increasing from 92 to 97. Daily average initial production of producing wells decreased from 143 bbl. in February to 133 bbl. in March.

Daily average production decreased from 210,000 bbl. in February to 208,000 bbl. in March. Total estimated production during March increased to 6,448,000 bbl. from 5,880,000 bbl. for the previous month.

Completions during the past week totaled 30 oil wells and 17 dry holes. Twelve of these, including one dry hole, were located in the Mattoon field, while the remainder were scattered throughout the various basin fields. First reports included nine wildcats, two in Richland County and one each in Coles, Shelby, Fayette, Wayne, Edwards, Gallatin, and Cumberland counties. New field operations totaled 40, including 2 in Clay County, 7 in Coles, 8 in White, 5 in Richland, 8 in Wayne, 3 each in Edwards and Wabash, and 1 each in Jefferson, Christian, Madison, and Clinton counties.

The Mattoon pool continues to be the center of drilling activity with 38 producing wells completed in March, and 62 wells in various stages of progress at the present time. Ingraham West in Clay County, discovered in August 1945, is attracting increasing interest with 11 new wells drilling. Other new pools undergoing active development are Brownsville in White County, Springerton in Hamilton County, Markham City West in Jefferson County, Keenville in Wayne County, and Samsville North in Edwards County.

ILLINOIS SUCCESSFUL WILDCAT

Christian County: John Wrather 1 T. M. Thompson, SE SE SE 15-15n-2w, pumped 31 bbl. oil and 42 bbl. water, 2,000 gal. acid, Devonian 1,870-77 ft., TD 1,896 ft., PB 1,888 ft.

ILLINOIS WILDCAT FAILURES

Bond County: Continental Oil Co. 1 Ostringer, SE SE NW 31-4n-4w, dry at 1,120 ft., Barlow 781 ft., Cypress sand 811 ft., Paint Creek 858 ft., Benoist sand 955 ft., Renault 987 ft., Aux Vases sand 992 ft., Ste. Genevieve 1,048 ft.

Aris Eakin 1 R. Eakin, NW SW SE 8-5n-1w, dry at 1,430 ft., Benoist sand 1,314 ft.

Cumberland County: National Oil 1 Decker, SE SE SE 6-10n-10e, dry at 2,052 ft.

Jefferson County: Texas 1 Burr Oak Coal, NW NE NW 8-4s-1e, dry at 2,832 ft., Menard 1,861 ft., Tar Springs 1,992 ft., Glen Dean 2,083 ft., Golconda 2,164 ft., Barlow 2,285 ft., Cypress sand 2,308 ft., Paint Creek 2,479 ft., Benoist sand 2,499 ft., Ste. Genevieve 2,670 ft., Rosiclare 2,715 ft., Fredonia 2,726 ft., McClosky 2,731 ft., St. Louis 2,776 ft.

Moultrie County: Collins Bros. 1 Lanum, NW SW SE 26-13n-5e, dry at 2,009 ft., Glen Dean 1,586 ft., Barlow 1,686 ft., Paint Creek 1,788 ft., Renault 1,874 ft., Aux Vases sand 1,900 ft., Ste. Genevieve 1,926 ft., Rosiclare 1,940 ft., Fredonia 1,956 ft., St. Louis 1,997 ft.

St. Clair County: Cain Syndicate 1 Leath, SE NW NE 8-1n-10w, dry at 603 ft., Devonian 320 ft., Trenton 551 ft.

Shelby County: N. V. Duncan 1 Shuemaker, NE NE NW 12-10n-6e, dry at 2,369 ft., Glen Dean 1,881 ft., Barlow 1,977 ft., Cypress sand 2,024 ft., Weiler 2,662 ft., Paint Creek 2,108 ft., Renault 2,182 ft., Aux Vases sand 2,199 ft., Ste. Genevieve 2,221 ft., Rosiclare 2,234 ft., Fredonia 2,282 ft., McClosky 2,294 ft.

Wayne County: Texas 1 M. H. Baird, SE NW SW 26-1s-5e, dry at 3,098 ft., Fredonia 3,060 ft., McClosky 3,064 ft.

OHIO, KENTUCKY

Ashland-Medina Gas Pool Extended to West

COLUMBUS.—Glenn Harmon 1 C. L. McFerrin, Section 3, Jackson Township, Ashland County, extends the new gas pool on the Ashland, Medina County line a location west. Clinton sand at 2,842-52 ft. gaged 901,000 cu. ft. natural and 1,115,000 cu. ft. when shut in after shot. Three additional wells are drilling in this area.

Preston Oil 1 O. D. Ervin, Section 2, Bedford Township, Meigs County, has been drilled in with a good showing of oil and 260,000 cu. ft. gas. Berea sand was logged at 1,635-50 ft.

Swingle et al 2 Dallas Stoneburner, Section 30, York Township, Morgan County, gaged 1,380,000 cu. ft. natural. Clinton sand was found at 4,000-43 ft.

Sixteen locations were reported for the week, six being in Cambridge, three in Ashland, and two each in Lancaster, Sandyville and Stewart. Of the 20 completions, Cambridge led with 5, followed by Ashland with 4 and Stewart with 3.

WESTERN KENTUCKY

OWENSBORO. — Western Kentucky completions showed a slight increase during the past week with five new oil wells and three dry holes, all development wells. One new wildcat was reported, G. H. Froderman 1 E. Cook, 2 miles northwest of Fulton, Fulton County, and is now drilling below 1,300 ft. with cable tools. Other first reports totaled seven and were located three in Henderson County and one each in Union, McLean, Davis and Webster counties.

EASTERN KENTUCKY

ASHLAND.—Four gas well completions, including one dry hole, and a 1-bbl. oil completion, marked operations in eastern Kentucky during the past week.

Kentucky-West Virginia Gas Co. completed well No. 5,417, John Mitchell property, Floyd County, total depth 3,429 ft., open flow of 189,000 cu. ft. in shale, after shot.

Kentucky-West Virginia Gas Co. completed well No. 5,636 on the Henry Thornsberry property, Knott County, total depth 3,188 ft., open flow 70,000 cu. ft.

Kentucky-West Virginia Gas Co. completed well No. 5638, John A. Music et al property, Johnson County, total depth 2,867 ft., open flow 600,000 Corniferous and Big 6.

Jackson Oil Co. completed well No. 4 on the Rufus Jackson Tract No. 2, Owsley County, total depth 1,060 ft., 1 bbl. oil.

INDIANA

EVANSVILLE.—H. E. Ledbetter & B. M. Heath 1 N. Utley, SE NE SW 30-5s-13w, Posey County wildcat, has set pipe for a

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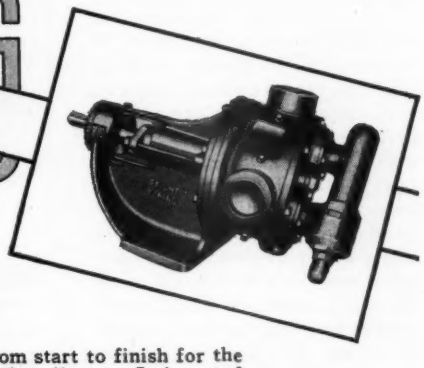

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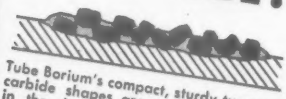

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test of the McClosky lime of 3,007-11 ft., total depth 3,111 ft. A 1½-hour drill-stem test of this formation at 2,980-3,111 ft. recovered 630 ft. of oil, 180 ft. of oil-cut mud, and 70 ft. of drilling mud with no water showing. The 1 Utley is located approximately 2 miles southeast of the Mink Island area of the New Harmony pool.

Only completions reported for Indiana during the past week were three oil wells and one dry hole, none of which were wildcats. Six new operations were reported, three for Posey County and one each for Gibson, Pike, and Spencer Counties. Rotary tools are being moved on location for the new Gibson County operation, T. C. Phillups 1 D. A. Epperson, NW SE NE 9-4s-11w, only new wildcat reported for the week.

LA.-ARK.

Richland Parish Wildcat Flows Oil and Salt Water

SHREVEPORT.—R. T. Sellars 1 L. P. Ford, NE NW NW 12-16n-7e, wildcat in Richland Parish, flowed 5 bbl. oil through ¼-in. choke on tubing after perforations at 2,845-50 ft. and 2,862-68 ft. The oil flow was accompanied with 5 bbl. salt water and squeezing is in progress to eliminate the water. Total depth of the well is 3,203 ft. The wildcat is west of production in the Big Creek pool.

G. C. Schoonmaker et al 1 Sample, 12-13n-14w, in the Holly area, De Soto Parish, completed as a dry hole in 1944, is to be drilled 300 ft. into the Travis Peak.

Charles F. Steele et al 1 H. L. Waters, N½ NW NE 20-14s-21w, wildcat in Nevada County, Arkansas, had the Nacatoch sand topped at 1,208 ft. and 9 ft. of oil sand with saturation logged. Total depth is 2,263 ft. with 7-in. casing cemented at 1,300 ft. Operators are now testing.

There were 16 completions in North Louisiana. Franklin Parish had one wildcat failure. Of the 15 field wells completed, 12 were oil, 2 were gas and 1 was dry.

Arkansas reported no wildcat completions. Field completions totaled eight. Village added two producers, Wesson and Stephens each had two producers and one dry hole.

LOUISIANA WILDCAT FAILURE

Franklin Parish: C. L. Smith 1 Polk Estate, NW SE 27-14n-7e, dry at 5,787 ft.

MISSISSIPPI

Adams County Wildcat Has Production Decrease

JACKSON.—The Sohio-Roeser & Pendleton 1 Baker-Maier, south 68° and 2,163 ft. east from northwest corner of 34-6n-2w, wildcat completed in Adams County, continues to decrease in oil production with an increase of salt water accompanied by a decline in flowing pressure. The well flowed 32 bbl. for the 24-hour period ending April 2 as compared with initial production of 97 bbl. on completion.

Testing gas, some oil, salt water and sand from perforations at 10,030-045 continued at the Phillips Petroleum 1 Davey, 330 ft. from northeast line of Lot 3 and 330 ft. from northwest line of 46-8n-2w, wildcat in Adams County. The well has continued to show salt water. Plans are to squeeze perforations, set retainer and drill ahead in order to test perforations at 10,060-70 ft.

A test through the Tuscaloosa in Clarke County, is to be drilled by the Sun Oil Co. with the Carter Oil Co. and the British American Co. contributing. The well will be the Sun Oil Co. 1 Long Bell Petroleum Co., NW¼ NW¼ 7-2n-17e.

Mississippi had one wildcat failure in Greene County. Of the five field wells completed, Cranfield had one oil and one dry. Flora added a producer with an initial production of 70 bbl. Two oil wells were completed in Heidelberg, West.

MISSISSIPPI WILDCAT FAILURE

Greene County: Humble Oil & Refining Co. 3 Harry Stover et al, 1,300 ft. south and 458 ft. west of northeast corner of 20-3n-7w, dry at 8,767 ft., Massive sand 8,238 ft.

OKLAHOMA

Western Garvin County Has Second New Oil Field

WESTERN Garvin County's second oil discovery of 1946 has been made by R. H. Dearing & Son 1 McBride, NE NW NW 30-4n-3w. The well flowed an estimated 5-10 bbl. of oil an hour from the basal Pennsylvanian sand through 40 perforations at 6,586-91 ft., with tubing chokes installed. A total of 28 ft. of sand was penetrated from 6,570-98 ft., and operators are expected to perforate opposite more of the section before completion. The well was drilled to a total depth of 6,665 ft. in the Hunton lime and 5-in. pipe was set at 6,660 ft. The Hunton has not yet been tested. The 1 McBride is about 6 miles north of the recent discovery by Globe-Vickers, and the pay sections in the two wells have been correlated.

The Oklahoma Natural Gas Co. 1 Oakwood Unit, NW NW NW 6-17n-14w, Dewey County wildcat, is reported drilling below 7,402 ft. in shale. This well is an offset to

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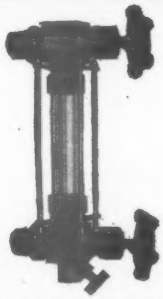

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a wildcat drilled a few years ago which had a good show of gas-condensate but was abandoned when the hole caved. Leasing throughout Dewey County is highly active, with both companies and individuals making large acquisitions. Most intensive leasing, however, is associated with the block surrounding the 1 Oakwood Unit.

A review of Oklahoma exploration for the month of March reveals that oil pools were opened in Garvin, Oklahoma, and Stephens counties, while a gas pool was discovered in Lincoln County. One new pay zone, the Hunton lime in the Washington pool, McClain County, was found.

OKLAHOMA SUCCESSFUL WILDCATS

Garvin County: Sohio 1 Tolbert, NE NW NE 9-3n-1w, 5,250,000 cu. ft. of gas from sand at 4,535-40 ft., TD 4,589 ft.

Major County: Superior Oil Co. 1 Manning, NE NE NW 27-22n-10w, 35 bbl. from Basal Pennsylvania at 6,700-41 ft., TD 8,274 ft.

OKLAHOMA WILDCAT FAILURES

Okfuskee County: Johnson et al 1 Scott, SW SW SE 34-10n-10e, dry at 3,390 ft., Cromwell 3,355 ft.

Pottawatomie County: K. G. F. F. 1 King Comm., SE SW SW 2-11n-6e, dry at 4,571 ft., sandy dolomite 4,570 ft.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, Washington 25, D. C. Notice is hereby given that sealed bids will be received until noon on April 22, 1946, for land described herein situated within the known geologic structure of the Garmesa gas field, 6th P.M., Colorado. This land is offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the Act of August 21, 1935 (49 Stat. 674, 30 U.S.C. sec. 226), in the following parcels: Parcel No. 1, T. 7 S., R. 102 W., sec. 31, Lots 7, 8, 9, 28, 31; T. 7 S., R. 103 W., sec. 36, W½NE¼, SE¼NE¼, SE¼, 317.21 acres. Parcel No. 2, T. 7 S., R. 103 W., sec. 25, S½SW¼; sec. 26 SE¼SE¼; Sec. 35 E½E½; sec 36 W½, 600 acres. Parcel No. 3, T. 8 S., R. 102 W., sec. 4, NW¼SW¼, S½SW¼; sec. 5, lots 31 to 39, inclusive, SE¼SW¼, SW¼SE¼, E½SE¼, 440.11 acres. Parcel No. 4, T. 8 S., R. 102 W., sec. 5, lots 8, 9, 10, 12, 17 to 30 inclusive; sec. 6, lots 8 to 23 inclusive, 647.42 acres. Parcel No. 5, T. 8 S., R. 102 W., sec. 6, lots 24 to 51 inclusive, 583.57 acres. Parcel No. 6, T. 8 S., R. 102 W., sec. 7, lots 5 to 9, inclusive, 17, 18, 123.53 acres. Parcel No. 7, T. 8 S., R. 102 W., sec. 8, lots 1 to 27 inclusive, 32 to 34, inclusive, 560.34 acres. Parcel No. 8, T. 8 S., R. 102 W., sec. 9, lots 1 to 6 inclusive, W½NE¼, E½W½, NW¼NW¼, SE¼; sec. 10, SW¼SW¼, 564.58 acres. Parcel No. 9, T. 8 S., R. 102 W., sec. 15; W½NW¼; sec. 16, lots 1, 2, NE¼, NE¼NW¼, 319.99 acres. Parcel No. 10, T. 8 S., R. 103 W., sec. 1, lots 5, 6, 8, 9, 11 to 17 inclusive, 26 to 30 inclusive, 403.43 acres. Total 4560.18 acres. Bids must be submitted on each parcel separately, but if two or more parcels are awarded to the same bidder they may be included in a single lease, provided the combined acreage does not exceed 640 acres. Each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.19. The envelopes should be plainly marked "Bid for Parcel No. .... Garmesa gas field. Not to be opened before noon, April 22, 1946." No bids received after the hour fixed herein for the opening of bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5000 corporate surety bond must be furnished by a successful bidder prior to the issuance of a lease. The deposits of the other bidders will be returned upon acceptance of the successful bids by the Secretary of the Interior. The successful bidder will be required to agree not to discriminate against any employe or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

KANSAS

Discovery Well Opens Rooks County Nyra Pool

ATLANTIC REFINING 1 Carmichael, SE SE 16-9-17w, has opened the Nyra pool in Rooks County with an initial production of 35 bbl. a day on pump from the Lansing-Kansas City limestone at 3,446 ft. The new pool is just south of the old Nyra pool abandoned several years ago and about 3 miles southwest of production in the Westhusin pool in Rooks County.

A possible new pool opener for Meade County is the Stanolind 1 H. G. Adams, SW SW SW 7-35-29w. Estimated production after perforations at 6,018-40 ft. and 6,090-6,125 ft. and acidization, was 2½ bbl. per hour. Operators installed pumping equipment and pumped 52 bbl. in 8 hours. Plans are to plug back and perforate in the Lansing.

Testing is in progress at the Rep. Nat. Gas 1 Cooper, center of south line, SE SE 14-7-20w, wildcat in Rooks County. Perforations were made at 3,499-3,508 ft. and the hole acidized. In a 24-hour period, 25 bbl. oil and 6 bbl. water was pumped. The Arbuckle was topped at 3,498 ft. Total depth was 3,539 ft.

Kansas reported 36 completions. One wildcat was completed as a successful gas well and four were dry. Of the 31 field wells completed, 5 were gas in the Hugoton field, 17 were oil and 9 were dry.

KANSAS SUCCESSFUL WILDCAT

Kearney County: Glenn Smith and Mid-Continent, NW SW SE 3-25-38w, 6,032,-000 cu. ft. gas from Winfield at 2,415-43 ft. and Fort Riley at 2,481-510 ft., TD 4,640 ft.

KANSAS WILDCAT FAILURES

Butler County: E. H. Adair 1 Brown, NW SE NE 20-27-7e, dry at 2,782 ft., Mississippi lime 2,750 ft.

Ellis County: Darby & Bothwell et al 1 Glass, NW NW SW 30-11-19w, dry at 3,758 ft., Arbuckle 3,723 ft.

Ellsworth County: Stearns et al 1 Dlabal, SE SE NE 3-15s-10w, dry at 4,115 ft., Simpson sand 3,280 ft.

Pawnee County: Huber Corp. and Kiowa Drilling 1 Barstow "A," SW SW SE 32-22-15w, dry at 4,049 ft., Arbuckle 4,043 ft.

CANADIAN FIELDS

Wet Gas Flow Increased in Brazeau Structure Test

CHATHAM.—More encouraging showings have been encountered with continued test of the Home Brazeau 1, deep test in LSD 5, 17-43-17w5, on the Brazeau structure in the Central Alberta foothills. In the first Madison lime above the fault, at 9,498-9,597 ft., additional acid treatment of 90 ft. of porosity with 3,000 gal. increased the wet gas flow from the initial 2,500,000 cu. ft. to 10,500,000 cu. ft. against a pressure of 650 lb. on the casing. Separator test is being made to determine the naphtha recovery. Plans are being made for additional wells on the extensive Brazeau structure.

Turner Valley.—In the Turner Valley north extension, Continental 1, LSD 8, 4-21-3w5, finished with Madison limestone at 7,918-8,745 ft., built up pressures exceeding 1,000 lb. with good oil recovery before acidizing, and looks like a large well. Testing is continuing.

Baxter Lake.—In the Baxter Lake area, in east-central Alberta near the Wainwright field, Union Drilling Co. of Calgary has secured exploration permit covering 19,840 acres in Townships 45 and 46, Range 5w4, north and east of the area already drilled, and is planning to drill, following favorable geological reports.

Fort Saskatchewan.—Drilling within a few miles of the city limits of Edmonton will be undertaken by Anglo-Canadian Oil Co. of Calgary, which has secured reservation on 49,311 acres surrounding Fort Saskatchewan. Acreage is in Townships 54-55, ranges 21-22w4 and Township 54-23w4, southwest of recent drilling on the Bruderheim structure.

Notikewin River.—In the extensive untested area on Notikewin River, in Northern Alberta, Anglo-Canadian Oil Co. of Calgary has secured reservation of 481,914 acres in Townships 90 to 95, Ranges 21 to 24w5. The acreage, on both sides of the Peace River, is some 12 miles north of the extensive Peace River drilling about 1920, in which numerous gas and oil shows were encountered. Owing to lack of structural conditions, the Peace River showings were accompanied by salt water but favorable structural conditions are indicated in the new area farther north.

Lundbreck.—Deepest cable tool test in Canada, Maxmont-Lundbreck 1, LSD 10, 20-9-2w4, on the Watson structure in the southern Alberta foothills is standing at 9,912 ft. waiting for new drilling line. Another test is drilling and location is being made for a third well.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, Washington, D. C. Notice is hereby given that sealed bids will be received until noon on Monday, April 29, 1946, for land described herein situated within the known geologic structure of the Mosby Dome, Cat Creek oil field, Montana. This land is offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the Act of August 21, 1935 (49 Stat. 674, 30 U.S.C. sec. 226), in the following parcels, all in T. 15 N., R. 30 E., P.M.; Parcel No. 1, sec. 22, S½NW¼, 80 acres; Parcel No. 2, sec. 22, NE¼SW¼, NW¼SE¼, 80 acres; Parcel No. 3, sec. 22, S½SW¼, 80 acres; Parcel No. 4, sec. 22, S½SE¼, 80 acres; Parcel No. 5, sec. 26, S½ NW¼, SW¼NE¼, 120 acres. Total 440 acres. Bids must be submitted on each parcel separately, but if two or more parcels are awarded to the same bidder they may be included in a single lease. Each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.19. The envelopes should be plainly marked "Bid for Parcel No. , Mosby Dome, Cat Creek oil field. Not to be opened before noon, April 29, 1946." No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished by a successful bidder prior to the issuance of a lease. The deposits of the other bidders will be returned upon acceptance of the successful bids by the Secretary of the Interior. The successful bidder will be required to agree not to discriminate against any employee or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

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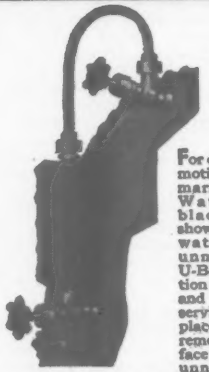

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Among the Drilling Contractors

Crew of Falcon-Seaboard Drilling Co. near Sherman, Tex.: Lee Peterson, driller; C. E. Bradford, geologist; Jack Starr, derrickman; J. W. Ward, motorman; Jack Pitchford, pipe racker; J. H. Hargesheimer, backupman, and Duncan Brown, catheadman

Harold W. Gooden, recently discharged from the Navy, has rejoined **Dee Drilling Co.**, Mount Carmel, Ill., of which he is a partner.

Fred Summers has the drilling contract on the Cooper & Lookabaugh 1 Winship, in SW NW SW 12-11n-8e, a semiwildcat south of the Dill area in Okfuskee County, Oklahoma. Location has been staked.

FWD Drilling Co. has drilling contract on the Hanlon-Buchanan, Inc., 1 Schroeder, in SW SW SW 17-19n-2e, west of Stillwater, in Payne County, Oklahoma, which was drilling at 3,409 ft.

Newt Barrett has been awarded drilling contract on the Davon Oil Co. 1 McVey-B, in NE NE NE 30-15n-7e, a semiwildcat east of Stroud, Okla., in Creek County. Surface pipe has been set at 140 ft.

Mealy-Wolfe Drilling Co., operator on the Cities Service Oil Co. 13 Livingston, in C NE NW 13-8n-6e, Seminole County, Oklahoma, was starting work. This is to be an Arbuckle lime test in the old Bowlegs field.

Glenn Gillespie & Son are contractors and have an interest in the J. A. Turner et al 1 Summers, in SW SW SW 34-21n-5e, Pawnee County, Oklahoma, south of Pawnee. Contractors were rigging up.

HH&B Drilling Co. has contracts on two Hughes County, Oklahoma, tests. Varco Oil Co. and Continental Production Co. were reported getting a producer at their 1 Whitney, in SW NW SW 3-6n-8e, in the Spaulding sector. Surface pipe has been set at the 1 R. B. Parks, in NE NW SE 3-6n-8e.

Hewgley Drilling Co. has the contract to drill a test for Sun Oil Co. in NW NW 7-2n-17e, Clarke County, Mississippi. The well is the 1 Long Bell Petroleum Co.

Edward Eads Drilling Co. has been awarded contract to drill two wells

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for W. L. Lichlyter et al in Pike County, Indiana. The wells are the 1 Ada Conley, 660 ft. from south line and 990 ft. from west line of SW NW 3-1s-9w, and the 1 W. Watkins, 330 ft. from south line and 990 ft. from west line in SW NW 15-1s-9w.

Victor Drilling Co. has recently been formed by Victor Scheef and Ralph M. Carter with offices at 1418 Broadway, Mattoon, Ill. They have purchased all new equipment and are prepared to drill to 5,000 ft.

C. E. O'Neal Drilling Co. has the contract to drill a wildcat test in Gibson County, Indiana, for T. C. Billups. The well is the 1 D. A. Epperson, in 9-4s-11w.

Harry Stroud Drilling Co. will drill the Eric P. Schelling 1 Michael Helmer, NE NW NW 30-4n-12w, in the Dorr pool, Allegan County, Michigan.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, Washington, D. C. Notice is hereby given that sealed bids will be received until noon on Wednesday, May 1, 1946, for land described herein situated within the known geologic structure of the Wilson Creek oil field, 6th P. M., Colorado. This land is offered to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the Act of August 21, 1935 (49 Stat. 674, 30 U.S.C. sec. 226), in the following parcels: T. 2 N., R. 94 W., Parcel No. 1, N½NE¼, SE¼NE¼ sec. 10, 120 acres, Parcel No. 2, NW¼ sec. 11, 160 acres. Parcel No. 3, NE¼ sec. 11, 160 acres. Parcel No. 4, N½SW¼ sec. 11, 80 acres. Parcel No. 5, SE¼ sec. 11, 160 acres. T. 3 N., R. 94 W., Parcel No. 6, SW¼ sec. 13, 160 acres. Parcel No. 7, S½SE¼ sec. 13, 80 acres. Parcel No. 8, NE¼ sec. 24, 160 acres. Parcel No. 9, W½SE¼ sec. 24, NW¼NE¼ sec. 25, 120 acres. Total, 1,200 acres. These lands lie within the approved area of the Wilson Creek unit agreement, and in accordance with 43 CFR 192.39, any successful bidder will be required to file, prior to the issuance of a lease, evidence that he has entered an agreement with the unit operator for the development and operation of the lands in the proposed lease under and pursuant to the terms and provisions of the approved unit agreement, or an affidavit giving satisfactory reasons for the failure to enter into such agreement. Bids must be submitted on each parcel separately, but if two or more parcels are awarded to the same bidder they may be included in a single lease provided the combined acreage does not exceed 640 acres. Each bidder must submit with the bid one-fifth of the amount bid in cash, or by certified check made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease, required under 43 CFR 192.19. The envelopes should be plainly marked "Bid for Parcel No. . . . Wilson Creek oil field. Not to be opened before noon, May 1, 1946." No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished by a successful bidder prior to the issuance of a lease. The deposits of the other bidders will be returned upon acceptance of the successful bids by the Secretary of the Interior. The successful bidder will be required to agree not to discriminate against any employee or applicant for employment because of race, creed, color, or national origin, and to require an identical provision to be included in all subcontracts. Bidders are warned against violation of section 59, U. S. Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Fred W. Johnson, Commissioner.

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PERSONALS

Planes, Racing Cars First Interest of George V. Carey

EXPERIENCE with racing car motors and as an airplane pilot was the stepping stone that projected George V. Carey into the oil business.

Carey, whose latest promotion has made him manager of the lubricating oil department of Signal Oil Co., was born in Dubuque, Iowa. He attended school in Los Angeles and later went into the garage business, spending much of his time working on racing cars.

World War 1 found Carey a pilot with the aviation division of the National Naval Volunteers. He was on the U.S.S. Huntington, convoying ships across the Atlantic. After the war, he went with Catalina Island Air Line and gained the distinction of being one of the first pilots to fly passengers from the mainland.

Carey entered the oil business in the lubricating oil department of Pacific Petroleum Products Co. and 3 years later went into business for himself with the organization of Southern Refining Co. He subsequently became associated with Quaker State Oil Co., and later with U. S. Refining Co.

In 1931, he joined Signal's lubricating oil department where he became technical adviser and assistant department manager. An active member of the Society of Automotive Engineers, Carey succeeds J. C. Harding, Jr., who retired as lubricating oil manager.

Joseph F. Leddy, Jr., who recently returned to the Bayway, N. J., refinery of Standard Oil Co. of New Jersey, following his separation as an Army major, has been made technical assistant in the refinery atmospheric distillation department.

Emanuel W. Bergquist has returned to Interstate Oil Pipe Line Co. as senior engineer at Shreveport following his separation from the Army. Also back with Interstate after service in the Navy is **Carl E. Stoker,** district engineer at Wewoka, Okla.

Aquela Marcano, an employe of Creole Petroleum Corp., has returned to Caracas, Venezuela, after completion of a 5-months' training period with Interstate Oil Pipe Line Co.

H. H. BEESON

Henry H. Beeson, former vice president of Sabine Valley Gasoline Co., Shreveport, has resigned to become assistant manager, natural gasoline department, Magnolia Petroleum Co. Beeson became associated with Sabine Valley in 1934 and as chief engineer supervised construction and operation of the company's gasoline plant in East Texas. He advanced to vice president and was elected a member of the board of directors in 1939. **F. E. Wimberly** succeeds Beeson as vice president and member of the board of directors of Sabine Valley Gasoline Co.

Ralph A. McGoey, who recently returned to Union Oil Co.'s field department after military service, has been appointed division engineer of the San Joaquin Valley division. Prior to entering military service McGoey spent several years in Union's southern division.

John H. Warden, general sales manager of Oklahoma Natural Gas Co., has resigned to become president of West Gas Improvement Co. of New York.

H. C. Goodrich, formerly Dallas district engineer for United Gas Pipe Line Co., has been transferred to the engineering section of the company's general offices in Shreveport, La. **A. H. McDonald,** formerly district engineer in southwest Louisiana, also has been shifted to the general office as gas engineer. **R. E. Oxford,** engineer in the Shreveport offices, succeeded McDonald as head of the southwest Louisiana district.

Myron W. Matson, Bradford, Pa., oil producer, has been elected a director of Sloan & Zook Co. to fill a vacancy caused by the death of William J. Sloan, former vice president, treasurer, and director.

P. N. Hume, drilling superintendent for Consolidado de Petroleo at Santa Barbara in eastern Venezuela, is scheduled to arrive in the United States in June where he will spend his vacation in California.

Joseph Zaba, former production engineer for Rio Bravo Oil Co., has opened a petroleum engineering consulting office in Houston, specializing in drilling and production problems, subsurface studies, valuation of producing properties and estimates of undeveloped acreage. A native of Poland who was educated in Europe and later received a master of science degree from the University of Pittsburgh, Zaba has spent 21 years in oil fields in Texas and Louisiana. He was associated in production work with Rio Bravo Oil Co. for 18 years. He is the author of a series of articles, "Oil Well Pumping Methods," which appeared in The Oil and Gas Journal beginning July 1, 1943.

Richard P. Price, assistant superintendent, Atlas refinery of Socony-Vacuum Oil Co., Inc., became superintendent April 1, succeeding **R. T. Lockwood** who retired. **Herbert Shepard** is the new assistant superintendent. Price came to the Atlas plant at Buffalo, N. Y., from the company's Paulsboro, N. J., refinery in 1944.

Lloyd A. Sommers, district supervisor for Creole Petroleum Corp. in western Venezuela, will return to Maracaibo this month following a business trip to St. Louis and New York.

Samuel K. Botsford and **Peter C. Jensen** have been named assistant secretaries of Standard Oil Co. (In-

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diana), filling vacancies caused by the promotion of **L. E. Harman** to secretary and the death of W. C. Ewald.

W. O. KNEALE

William O. Kneale, who joined The Texas Co. in 1923 as an assistant geologist and who has been assistant manager of the Southern Texas division of the producing department, has been advanced to acting division manager in Houston. He succeeds **J. A. Bermingham,** division manager who is retiring after a career in the oil business which began at the time of the Spindletop boom in 1901. Though retiring from active service, Bermingham will continue to serve as a consultant on the staff of **L. E. Barrows,** manager of the producing department.

George W. Young, purchasing agent for Standard Vacuum Oil Co., is in London on business.

Joe King, former captain in the Army corps of engineers, has joined Tennessee Gas & Transmission Co. as assistant compressor superintendent in the operating department.

V. R. Oakley, vice president in charge of manufacturing for Bareco Oil Co., has been elected a director of the company. Other personnel changes in Bareco's organization: **G. F. Racette,** a vice president in charge of sales, resigned to enter business in Tulsa; **R. E. Stewart,** assistant sales manager, made sales manager; **C. E. Votrian,** secretary-treasurer, elected vice president and treasurer; and **Gentry Lee,** elected secretary.

Sam F. Shakely, senior petroleum engineer for Carter Oil Co., has been transferred from the Dix, Ill., district, to Wilson, Okla. **Samuel R. Marsh,** Carter Oil party chief, has been shifted from Forest, Miss., to Venezuela. Another party chief, **Sam Zimmerman,** has been transferred from Alexandria, La., to Tulsa. A group of Carter junior geophysicists have been transferred from Tulsa as follows: **Jack N. Baker** and **Owen W. Jones,** to Dermott, Ark.; **Sam J. Dallison** and **Wilson C. Spicer,** to Rawlins, Wyo.; **Harold R. Friend** and **James M. Watson,** to Texarkana, Ark.; **Stanley Guilio** and **Craig P. Howes,** to Forest, Miss.; **Gary W. Hudiburgh** and **William J. Lang,** to Alexandria; **Christy Jones** to Ruston, La.; **Herbert O. Kimmel** to Mansfield, La.; **D. J. Studebaker,** to Monroe, La.; **David W. Swanson,** to Farson, Wyo.; **Vincent M. Tharp** and **George W. Wallis,** to Lawton, Okla.

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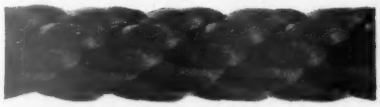

Equipment Men in the News

Jones & Laughlin Announces Personnel Changes

H. M. KNOBLOCH

Establishment of a new district sales office in Indianapolis and changes involving its district sales offices in Los Angeles and San Francisco, and South Bend, Ind., have been announced by Jones & Laughlin Steel Corp.

H. M. Knobloch has been appointed district sales manager in Indianapolis. He has been assistant sales manager in Cincinnati. R. G. Scoggins has been appointed district sales manager in Los Angeles. He succeeds T. W. Bell

W. S. WAINRIGHT

W. L. O'CONNELL

who has been appointed special sales representative in Los Angeles. W. S. Wainright has been appointed district sales manager in San Francisco. For the past 5 years he has been a salesman in the wire sales department in Pittsburgh. W. L. O'Connell has been appointed resident manager of sales in South Bend. He has been resident manager of sales in Indianapolis since 1942.

Ame Vennema to Supervise Schlumberger Gun Perforating

Col. Ame Vennema, on leave of absence with the U. S. Army for 5 years, has rejoined Schlumberger Well Surveying Corp. and has been appointed assistant to the Louisiana division manager in charge of gun perforating and allied services. The Louisiana division maintains headquarters in New Orleans. Before entering the Army in December 1940, Vennema was stationed at Houma, La., where he was employed as an electrical logging engineer for Schlumberger.

Watson-Stillman Advances F. H. Stillman, A. G. York

A. G. York and F. H. Stillman have been elected to the board of directors of The Watson-Stillman Co. Announcement of the appointments was made by E. A. Stillman, president and chairman of the board, at the company's main plant in Roselle, N. J. York continues also as vice president and general sales manager of both the hydraulic machinery and distributor products divisions of the company. He has been associated with Watson-Stillman for more than 25 years. Stillman, grandson of the company's founder and nephew of the present president, has been with the company 11 years.

Byron Jackson Acquires Patterson-Ballagh Corp.

E. S. Dulin, president of Byron Jackson Co., and J. C. Ballagh, president of Patterson-Ballagh Corp., jointly announce the acquisition by Byron Jackson Co. of all of the outstanding stock of Patterson-Ballagh Corp.

Patterson-Ballagh will operate as a separate division of Byron Jackson Co., which company has owned a minority interest in Patterson-Ballagh since its formation and which has been working in close harmony with that firm through the presence of Dulin on its board of directors.

Both Byron Jackson Co. and Patterson-Ballagh are well known throughout the oil industry and their products are used in every operating oil field of the world, Patterson-Ballagh being mainly concerned with the fabrication of important rubber specialties along with certain other products noncompetitive with those of Byron Jackson Co.

The merger of these companies will supplement the efforts of each and, coupled with the expansion programs now planned for domestic and foreign operations of both the oil tool and pump divisions of Byron Jackson Co., comes at a very opportune time.

Patterson-Ballagh is one of the pioneers in the oil-tool industry, founded in 1927 and introducing the rubber casing and drill-pipe protectors. Since then many additions to the line of products have been made and are being contemplated, including the wire line guide, pipe wiper, swivel and traveling block bumpers, and the mud gun. In development are many items for producing wells, including a deep well swab, sucker-rod wipers, and wire-line wipers.

No immediate changes in management, personnel, or sales distribution, are being contemplated. The manufacture, sales, and distribution of Patterson-Ballagh items will remain under the Patterson-Ballagh name. J. C. Ballagh will continue as president and general manager of the firm. D. G. Miller continues as secretary. He has been associated with Patterson-Ballagh many years and is the inventor and designer of many of their most important items, as well as being a pioneer in the turbine pump industry.

Gar Wood Announces Changes

R. J. NYMBERG

R. J. Nymberg has been named sales manager of the hoist and body division of Gar Wood Industries, Inc., Detroit, according to an announcement by W. H. Hammond, vice president in charge of sales. Nymberg joined Gar Wood in 1921 as a body engineer, and was made sales engineer in 1932.

Other appointments follow:

Henry Husbands has been named to assist Amos E. Heath, district manager of the company's general line in Washington, in contacting government agencies. Ross Miller, district manager, general line, is acting temporarily as manager of Gar Wood's Philadelphia branch, succeeding A. E. Hilderley, retired. Edward F. Kreutzfeld has been named service manager of the hoist and body division to succeed Miller. William F. Keeton has been placed in charge of the company's newly created advertising department.

Charles J. Hoffman has been placed in charge of the export department.

Johnson Named Pritchard's Tulsa Manager

Karl E. Johnson has recently been assigned manager of J. F. Pritchard & Co.'s Tulsa office. He is a graduate mechanical engineer from the University of Kansas. He served as power engineer for the Westinghouse Electric Co. for several years, prior to entering the U. S. Navy. He will represent Pritchard in its petroleum, chemical, gas, power, and equipment divisions, which includes cooling towers and allied products.

Stewart & Stevenson Opens Two Texas Offices

Stewart & Stevenson, Houston, announced the opening of branch sales and engineering offices at 4801 Lemmon Avenue, Dallas, and 19 East Highway, McAllen, Tex. The Dallas branch will be under direction of Charles L. Ward; the McAllen branch will be managed by Richard N. Conolly. The Dallas branch will serve Central and North Texas industries, and the McAllen branch will serve Southwest Texas, including the Rio Grande Valley.

Sherwood Eastern Sales Manager For Petro-Chem Development Co.

Petro-Chem Development Co. of New York City, designers, fabricators and erectors of furnaces for the petro-chemical industries, announces appointment of Arthur H. Sherwood as eastern sales manager.

Sherwood spent some 30 years with Wilson-Snyder Manufacturing Co., from which he retired the first of this year.

Weber Promoted by Le Roi

J. M. Dolan, vice president in charge of sales, announces the appointment of Ralph N. Weber as service manager of Le Roi Co., Milwaukee.

Wofford Goes to South America

Denver F. Wofford, representative for Reed Roller Bit Co., has left for a swing around South America. Among countries he plans to visit are Venezuela, Colombia, Peru, and Trinidad. Wofford was a first lieutenant in the paratroopers, fighting in France and Germany, during the war. He was connected with Reed prior to entering the service.